DOCUMENT RESUME

ED 334 507 CG 023 522

TITLE	The Effectiveness of Drug Abuse Treatment: Implications for Controlling AIDS/HIV Infection. Background Paper 3.
INSTITUTION	Congress of the U.S., Washington, D.C. Office of Technology Assessment.
REPORT NO	OTA-BP-H-73
PUB DATE	Sep 90
NOTE	161p.; For previous papers in the series, see ED 301 781-782.
AVAILABLE FROM	Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325 (Stock Number 052-003-01210-3, $7.50).
PUB TYPE	Reports - Research/Technical (143)
EDRS PRICE	MF01/PC07 Plus Postage.
DESCRIPTORS	*Acquired Immune Deficiency Syndrome; At Risk Persons; Counseling Effectiveness; Drug Abuse; *Drug Rehabilitation; Educational Strategies; Government Role; *Outcomes of Treatment; *Prevention

ABSTRACT

This background paper examines evidence for the effectiveness of treatment for drug abuse and evaluates the role of drug abuse treatment as a strategy to prevent Human Immunodeficiency Virus (HIV) spread. Because most intravenous (IV) drug users are not in treatment, the study also examines other approaches to HIV prevention. The remainder of the first chapter summarizes the main findings. Chapter 2 reviews the current situation regarding drug use and HIV infection in the United States. Chapter 3 provides background information about the drugs of abuse and various treatment modalities. Chapters 4 and 5, respectively, review the existing literature on the effectiveness of drug abuse treatment and examine the role of drug abuse treatment in preventing HIV infection. The appendices describe the method of study and the drugs of abuse other than narcotics and stimulants; summarize a cost-benefit analysis of drug abuse treatment; and review highlights from the most recent National Drug and Alcoholism Treatment Unit Survey. (LLL)

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OTA Advisory Council, or individual members thereof.

The Effectiveness of Drug Abuse Treatment: Implications for Controlling AIDS/HIV Infection

Jane E. Sisk, *Project Director*

Evridiki J. Hatziandreu, *Study Director*

Rita Hughes, *Research Assistant*

Other Contributing Staff

Sharon Hamilton, *Research Assistant*
Virginia Cwalina, *Office Administrator*
Eileen Murphy, *P.C. Specialist*
Carolyn Martin, *Word Processor Specialist*
Angela Dantzler, *Secretary*

September 1990

A Background Paper in OTA's
Series on AIDS-Related Issues

The views expressed in this Background Paper do not necessarily represent those of the Technology Assessment Board, the Technology Assessment Advisory Council or their individual members.

This paper was prepared for desk-top publishing by Carolyn Martin and Eileen Murphy.

PREFACE

The impact of AIDS and other disease associated with the human immunodeficiency virus (HIV) on the Nation's health and health care resources is continuing. Congress has responded to the AIDS crisis with large increases in Federal funds for basic and applied research and education and has begun to grapple with the difficult issues involved in financing AIDS-related health care. AIDS is on the agenda of a large number of congressional committees and raises numerous important issues that require congressional attention and decisions. These developments led to a recommendation, in May 1987, by OTA's Technology Assessment Board, with encouragement from the Legislative Subcommittee of the House Appropriations Committee, that OTA provide assistance on AIDS-related issues to Congress on a sustained basis. That request led to OTA's series of studies on AIDS-related issues. This Background Paper is the sixth in that series. In 1989, the Board extended the OTA project on AIDS for another 2 years.

This Background Paper examines the evidence of the effectiveness of drug abuse treatment; it also evaluates the role that such treatment might play in reducing the spread of HIV. Because most intravenous drug users are not in treatment, the paper also examines other approaches to HIV prevention among this high-risk group.

The preceding papers in this series were *Do Insects Transmit AIDS?* (September 1987); *AIDS and Health Insurance - An OTA Survey* (February 1988); *How Effective Is AIDS Education* (June 1988); *The Impact of AIDS on the Kaiser Permanente Medical Care Program (Northern California Region)* (July 1988); and *How Has Federal Research on AIDS/HIV Disease Contributed to Other Fields?* (April 1990) (see inside back cover for information on how to order these publications). Previous OTA reports addressing AIDS-related issues include: 1) *Blood Policy and Technology* (January 1985), 2) *Review of the Public Health Service's Response to AIDS* (Technical Memorandum, February 1985), 3) *The Costs of AIDS and Other HIV Infections: Review of the Estimates* (Staff Paper, May 1987), and 4) *Medical Testing and Health Insurance* (August 1988).

John H. Gibbons

JOHN H. GIBBONS
Director

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INTRODUCTION

Two health epidemics in the United States have overlapped with disastrous results: drug abuse, a chronic relapsing disorder, and human immunodeficiency virus (HIV) infection, the cause of AIDS. Because these epidemics have affected a wide range of areas from medical care to law enforcement, the cost to society is substantial, both in tangible and intangible terms. A fatal link between the two epidemics compounds the problem, as the multiplicity of HIV transmission modes makes drug users, intravenous (IV) drug users in particular, a critical group in the spread of HIV infection.

Three modes of transmission connect drug abuse and HIV infection. One occurs among IV users of drugs, primarily heroin and cocaine, who share injection equipment that is contaminated with infected blood. Through sexual transmission, the second mode, infected IV drug users may pass HIV to their sexual partners. In particular, crack, a smokable and powerful form of cocaine, is associated with sexual behaviors at high risk of HIV transmission. The third mode of transmission occurs during pregnancy or shortly after birth, when women infected through IV drug use or by IV drug-using sexual partners may transmit the virus to their infants.

The use of psychoactive substances ranges from casual and recreational use to abuse and dependence or addiction. Although all degrees of drug use, if associated with certain behaviors, put users at risk of HIV infection, more frequent high-risk behaviors, of course, increase the likelihood of viral transmission. Substance dependence, the most severe condition, is characterized by compulsive use and loss of control over drug use (6). Continued use despite adverse consequences, failed attempts to stop, considerable time spent procuring the drug, and symptoms of tolerance and withdrawal are characteristic of substance dependence. A substance abuser continues use despite social, occupational, psychological , or physical problems or despite recurrent use in physically hazardous situations. Casual users, the least serious category, take certain drugs only occasionally or in low or moderate doses, usually in social contexts, and do not exhibit the maladaptive behavior patterns associated with substance dependence and substance abuse. Casual use still poses risks to the individual and society since any needle-sharing or drug-associated high-risk sexual behaviors may transmit HIV and other infections.

In this Background Paper, the terms drug abuse and drug dependence are used interchangeably, and the term drug abuser also includes drug addicts, who have lost control over their substance use.

Drug abuse is a chronic relapsing disorder; its pattern of relapses and remissions resembles other chronic diseases, such as arthritis and chronic depression. Similarly, no treatment exists to totally eradicate the condition. Unlike treatment for acute conditions, such as a broken leg or a simple infection, treatment for drug abuse shares the same objectives as treatment for other chronic conditions: 1) amelioration of symptoms (e.g., impaired functioning) and 2) prolongation for as long as possible of symptom-free intervals (e.g., maintenance of the desired behavior changes).

Preventing the spread of HIV among drug abusers is a formidable task. That drug abuse is a chronic relapsing condition and that drug abusers are a heterogeneous population with other social and behavioral problems pose obstacles to effective treatment. Moreover, the increasing use of injectable and smokable cocaine, coupled with the lack of an effective medication to treat cocaine abuse, makes even more difficult the control of HIV. Sexual behavior appears more difficult to modify than needle-sharing behavior. This fact further underscores the diligence required to halt this tremendous public health challenge (341).

This OTA Background Paper has a dual role: it examines evidence for the effectiveness of treatment for drug abuse and evaluates the role of drug abuse treatment as a strategy to prevent HIV spread. Because most IV drug users are not in treatment, the study also examines other approaches to HIV prevention among this high-risk group.[1]

The remainder of this chapter summarizes the main findings. Chapter 2 reviews the current situation regarding drug use and HIV infection in the United States. Chapter 3 provides background information about the drugs of abuse and various treatment modalities. Chapters 4 and 5, respectively, review the existing literature on the effectiveness of drug abuse treatment and on its role in preventing HIV infection. The various appendixes describe the method of the study; acknowledge experts in the field who provided valuable advice; describe drugs of abuse other than opiates and cocaine; summarize a cost-benefit analysis of drug abuse treatment; and review highlights from the most recent National Drug and Alcoholism Treatment Unit Survey.

SUMMARY OF THE FINDINGS

Magnitude of the Problem

HIV is transmitted through sharing contaminated needles and other equipment used to inject drugs. The sharing of injection equipment is a common practice throughout the United States in areas of high and areas of low HIV seroprevalence, with reported rates of sharing among IV drug users as high as 70 to 100 percent (8). Heroin and cocaine alone or in combination are the most common injectable drugs, while amphetamines are popular in certain parts of the country. Overall, the estimated number of IV drug users in the United States ranges from 1.1 to 1.8 million (64,220,307). Using data through 1985, the National Institute on Drug Abuse (NIDA) estimated that there are 500,000 IV heroin addicts; 250,000 IV heroin users who are not addicts; 475,000 IV cocaine users; 150,000 overlapping IV cocaine and heroin users; and 25,000 IV users of other drugs (282). Given estimation problems and the passage of time, however, the actual number of IV drug users may differ substantially (282).

Of all IV drug users, 80 to 90 percent are not in treatment at any given time (216a,332a,341). Among users not in treatment who volunteered to participate in U.S. urban outreach programs from 1987 to 1989, 34 percent injected predominantly heroin, 31 percent cocaine, 33 percent combinations of heroine and cocaine, and 2 percent amphetamines or other drugs (340). Heroin was the predominant drug for almost 60 percent who reported *daily* drug injection. Most of these volunteers, 60 percent, had previously been in treatment. Substantial proportions engaged in behaviors that put them at high risk of contracting or transmitting HIV: 78 percent reported sharing drug injection equipment with another IV drug user; 20 percent shared equipment with strangers; and 48 to 85 percent, depending on the type of sexual activity, never used a condom (340).

Of approximately 350,000 drug clients in treatment in fall 1989, about 41 percent had used drugs intravenously (332a). Public and private facilities across the country reported treating almost 1 million drug users of all kinds during the year ending with September 1989.

The association between drug use and HIV infection is not confined to IV drug use. Sexual behaviors associated with the crack epidemic, such as sex for drugs, casual sex with multiple partners, and careless sex while high on drugs, put drug users at increased risk of HIV infection (112). In 1988, about 1 million people in the United States had used crack in the past year, and about 0.5 million had smoked it in the past month (330). Among 1988 high school seniors, about 3 percent reported having smoked crack during the previous year (320a).

Counting drug users and their sexual partners, an estimated 1.8 million people are at risk of contracting HIV (318). Currently, IV drug use is the second most common risk behavior reported for AIDS cases in the United States, surpassed only by unsafe sex among homosexual or bisexual men. In several Northeastern States and Puerto Rico, the number of

[1]This paper does not examine issues related to drug abuse and HIV infection among adolescents. These issues are addressed in an upcoming OTA Report on adolescent health expected to be published in early 1991.

adult AIDS cases among IV drug users exceeds those among homosexual men (335). Among women with AIDS through May 1990, about 70 percent were associated with IV drug use or an IV drug-using sexual partner (349). Moreover, about 70 percent of the children with AIDS who were presumably infected through perinatal transmission had mothers who were IV drug users or sexual partners of IV drug users.

African-Americans and Hispanics constitute 20 percent of the U.S. population, but 44 percent of AIDS cases through May 1990 (304a,349). In AIDS associated with drug use, these groups have also been disproportionately affected; they have accounted for 79 percent of AIDS among IV drug users, 77 percent of AIDS among heterosexual partners of IV drug users, and 85 percent of children presumably infected through mothers who were IV drug users or sexual partners of IV drug users (349).

Because of AIDS' long gestation period, current AIDS cases reflect drug use patterns and high-risk behaviors that occurred 5 or more years ago. The impact of more recent trends of heavy cocaine and crack use, which are associated with high-risk behaviors for transmitting HIV, is yet to come.

Although declining trends in casual use of illicit drugs have been reported from national surveys, these figures may underestimate the magnitude of the problem. The major surveys exclude certain population groups that have a higher likelihood of drug abuse, such as homeless people and those in prisons and jails (304,330). In addition, the magnitude of underreporting may have increased in recent years, as social tolerance toward illicit drug use has decreased (304).

Assessing the Effectiveness of Drug Abuse Treatment

This Background Paper focuses on the three treatment approaches that have been subjected to the most evaluation: outpatient methadone maintenance programs, residential therapeutic communities (TCs), and outpatient drug-free (ODF) programs. Although other medications besides methadone are being developed and evaluated, none is in widespread use. Traditional TCs and ODFs fall into the category of programs that on philosophical grounds do not employ medications.

Evaluations of the effectiveness of treatment assess whether a particular treatment approach has reduced behaviors associated with drug abuse, chiefly the frequent use of heroin or cocaine. Certain methodological problems handicap interpretation of the results. Almost all evaluations have studied groups of people entering treatment programs and compared their behaviors before and after treatment. Recovery from drug abuse, however, may be influenced by many factors, such as previous treatment episodes, involvement with the criminal justice system, pressure from family and friends, and religious involvement. These factors may interact or operate independently.

Without randomly assigning people to treatment and having a control group for comparison, one cannot separate the effect of treatment from the effect of other factors that might affect behavior, such as the individual circumstances of the people who choose treatment (see ch. 4). Interpretation is rendered more difficult by the lack of information about the history of drug abuse careers. Although some people reduce or eliminate drug use without treatment, not enough is known about the natural history of this chronic, relapsing condition to estimate how many would improve regardless of the intervention. In addition, the results generally consist of behaviors reported by the drug abusers studied, reports that may be biased. On average, however, these self-reports have been found to conform to other sources of information (149,267).

Although research on drug abuse has intensified, no completed studies have evaluated treatment for crack. Nor are evaluations of more recent variations in traditional approaches, such as shorter residential programs and self-help groups, yet available.

Methadone Maintenance

Efficacy and Effectiveness--Methadone is a synthetic narcotic used to treat dependence on opiates. Heroin, the most frequently abused opiate, is administered mainly by injection. When administered regularly in adequate doses, methadone can reduce the craving for heroin, prevent the onset

of opiate withdrawal symptoms, and block euphoria from heroin. Daily methadone is administered orally, usually to outpatients. By reducing drug craving and fear of withdrawal and blocking euphoria from heroin, methadone enables heroin abusers to reduce IV drug use and associated risky behaviors.

Although all methadone maintenance programs share the objective of reducing opiate use and changing behavior, they vary in their orientation, with some emphasizing eventual cessation of drugs, including methadone, and others accepting indefinite maintenance on methadone. In addition, methadone maintenance programs vary in methadone dose, counselling and other rehabilitative services, policies regarding discharge and readmission, take-home privileges, and frequency of urine testing.

Methadone's ability to reduce use of heroin and other illicit opiates has been shown in numerous studies over 25 years. Consistent evidence and strong study designs bolster this conclusion.

For example, in a randomized controlled trial of maintenance on methadone v. placebo, after 3 years, 56 percent of those maintained on methadone remained in treatment, while only 2 percent given placebo remained (227). Although monthly heroin use among those on methadone stabilized at about 35 percent, 63 percent of the control group compared with only 5 percent of the methadone maintenance group were removed from treatment because of persistent heroin use. A natural experiment comparing clients involuntarily discharged when a clinic closed with a matched sample in a continuing clinic found similar results (207). Of those involuntarily discharged, 55 percent resumed heroin addiction compared with 31 percent in the continuing clinic.

Reports of opiate use before and after treatment have found the same pattern (see table 1-1). On average, 75 percent of the clients in long-term methadone maintenance have ceased illicit opiate use (258). Methadone maintenance programs also retain 55 to 85 percent of their clients for a 2-year

Table 1-1--Percent Self-Reported Outcomes by Clients in Methadone Maintenance Treatment, Selected Studies

	DARP[a]		TOPS[b]		Ball Study[c]	
Category	Before treatment	Year after treatment	Year before treatment	Year after treatment	In treatment 0.5 to 4.5 years	In treatment over 4.5 years
Opiate use[d]	100	36	63.5	16.7	15.8	3.4
Cocaine use[d]	NA	NA	26.4	17.5	26.6	17.2
Criminal activity[e]	88	27	31.8	19.0	11.1	9.4
Employment[f]	33	57	24.2	20.1	NA	NA

ABBREVIATION: NA = Not available.

[a]DARP, the first federally funded national multimodality study of treatment effectiveness, began in 1969. Findings refer to white and black males only. Data refer to all clients who were admitted to treatment, regardless of the length of time spent in treatment. Average followup rates were 79 percent for cohorts admitted to treatment from 1969 to 1971 and from 1971 to 1972 and 64 percent for the cohort admitted in 1973 to 1974.

[b]TOPS, a federally funded national multimodality study, began in 1979. Results pertain to the 68 percent of clients who stayed in treatment at least 3 months. The average response rates for a sample of 1,539 clients, regardless of time in treatment, were 80 percent for the year before treatment and 75 percent for the year after treatment.

[c]Ball and colleagues conducted a cross-sectional study of six programs in the Northeast. The study sample was a representative sample of clients including new admissions and clients already in treatment.

[d]Daily opiate use for DARP, weekly or more frequently for TOPS, and use during the past 30 days for the Ball study.

[e]Criminal activity refers to any arrest during one's lifetime before treatment or in the year following treatment in the DARP study; self-reported involvement in predatory crimes, excluding crimes related directly to drug use, in the TOPS study; and any criminal activity in the past 30 days in the Ball Study.

[f]Employment refers to employment half-time or more during the year before treatment or during the year after treatment in the DARP study, and to full-time employment in the TOPS study.

SOURCE: Ball, Corty, Meyers, et al. (20); Hubbard, Marsden, Rachal, et al. (149); Simpson, and Sells (272).

period, rates far higher than those of other modalities for treating drug abuse (258). These retention rates may in part be related to patient selection. Since Federal guidelines for methadone maintenance specify that clients must have received previous treatment, they may be older and further advanced in the addiction career compared with other drug abusers (13).

Methadone maintenance's role specifically as a means to prevent HIV infection has been examined in about a dozen studies. In New York City, San Francisco, Sweden, and Italy, drug abusers who have entered treatment early in the epidemic and remained in treatment have consistently had lower seroprevalence rates than those who entered later (1,36,40,132,228,291,295,374,376). Methadone maintenance thus may have exerted a protective effect by reducing IV drug use.

Although IV heroin use can be curtailed with sufficiently high doses of methadone, methadone cannot address pharmacologically the concurrent IV or non-IV use of other drugs, most notably cocaine. It has been observed, however, that a proportion of IV drug users stop using IV cocaine while on methadone maintenance (149). The use of IV cocaine is of particular relevance to efforts to halt the spread of the HIV epidemic, since IV cocaine use appears to be associated with a greater frequency of injections and sharing of injection equipment (110). It has also been associated with an increased risk of HIV infection among methadone maintenance clients (49,276). These complexities further underscore the need for a range of prevention interventions to reduce the spread of HIV transmission.

OTA finds that there is strong and consistent evidence that methadone maintenance treatment can reduce illicit opiate use and HIV transmission. This protection is a direct result of methadone maintenance's ability to reduce or eliminate abusers' desire to inject drugs, heroin in particular. In addition, studies have shown methadone maintenance clients reducing their criminal activity and living stable and productive lives.

Methadone Dosage--Research establishes whether an intervention is efficacious in achieving its goals. Even an efficacious intervention, however, if employed sub-optimally, may prove ineffective. Despite methadone's ability to reduce heroin use, considerable variability exists in reported rates, with as high as 57 percent of clients reporting some level of heroin use in some programs (21). Although this variability may be attributed to client characteristics, evidence points to non-client related variables (21). Such variation suggests that somewhere in the implementation process, effectiveness may have been compromised.

Insufficient methadone dosage may at least partly explain the differences observed. An adequate dosage is needed to prevent drug craving and withdrawal symptoms and block heroin's euphoria. Methadone dosage has been shown to be related to effectiveness, clients' remaining in treatment, and HIV seropositivity (40,66,69,98,130,376).

Research indicates that a daily dosage in the range of 50 to 100 mg, with a mean of 80 mg, is sufficient for most patients (130). A daily dose of 60 mg is considered to be close to the lowest effective dose (257). Pooled data on dosage from 6 methadone programs found an inverse relationship between daily methadone dose and frequency of heroin use (98). At a daily dose of 35 mg or less, a little over one-third of the clients used heroin regularly. By contrast, at 80 mg per day, there was practically no opiate use. A recent survey of 24 methadone maintenance programs around the country revealed that daily average dosages ranged from 21 to 67 mg, and 21 of the 24 programs administered an average daily dose below 60 mg (299).

Interim Methadone--The concept of interim methadone calls for temporary provision of methadone and HIV counseling, without additional ancillary services, to IV drug users who are on waiting lists until treatment space in a comprehensive program becomes available. Interim methadone, which has been proposed exclusively as an alternative to continued heroin injection in the street, has the potential to contribute to HIV prevention efforts. In a randomized experiment among those on waiting lists in New York City, prevalence of heroin use, needle use, and mean number of days since last injection were lower in the interim methadone group than the control group (264).

Concerns have been expressed that adopting interim methadone would worsen methadone maintenance programs, for example, by permanently reducing the services provided (235,241a,363). These concerns are worth considering. The urgency of the HIV epidemic, however, adds an additional dimension and warrants a clear focus on societal priorities. Individuals who respond to methadone will reduce IV use of heroin. Any sustained reduction in injection frequency is likely to reduce the rate of HIV transmission and shrink the pool of people at risk. From a public health perspective, this is a need that should not be ignored. Interim methadone may be more appropriate for certain areas with large number of IV drug users and waiting lists, such as New York City. Nevertheless, interim methadone is an immediate response to an urgent situation.

Other Treatment Modalities

Therapeutic Communities--Traditional TCs are residential programs with a planned duration of treatment of approximately 18 to 24 months. The fundamental philosophy of these programs is that drug abuse reflects personality problems and chronic long-standing deficiencies in social, educational, and marketable skills. TCs provide a highly structured and often confrontational environment, where peer pressure along with counseling and therapy is intended to produce attitude and value changes and a drug-free lifestyle.

Although methadone acts only on narcotics abuse, TCs serve individuals with a host of different primary drugs of abuse. Evaluations conducted in the 1970s and 1980s consistently found substantial reductions in heroin and cocaine use among people who remained in treatment (table 1-2) (76,81,149, 272). Clients of Phoenix House, a large traditional TC, reduced heroin use from 86 percent before treatment to 5.8 percent 2 years after treatment (76). Similarly, according to a national study begun in 1979, TC clients who remained in treatment at least 3 months reduced heroin use from about 31 percent 1 year before treatment to about 12 percent the year after treatment and cocaine use from about 28 percent before to about 16 percent the year after treatment (149). These studies also found reductions in criminal activity and increases in employment.

Table 1-2--Percent Self-Reported Outcomes by Clients in Therapeutic Communities, Selected Studies

	DARP[a]		TOPS[b]		Phoenix House[c]	
Category	Before treatment	Year after treatment	Year before treatment	Year after treatment	Before treatment	2 years after treatment
Opiate use[d]	100	39	30.9	11.5	86.0	5.8
Cocaine use[d]	NA	NA	27.6	15.5	NA	NA
Criminal activity[e]	95	33	60.9	28.9	76.2	29.8
Employment[f]	20	61	15.3	27.7	26.4	48.8

[a]DARP, the first federally funded national multimodality study of treatment effectiveness, began in 1969. Findings refer to white and black males only. Data refer to all clients who were admitted to treatment, regardless of the length of time spent in treatment. Average followup rates were 79 percent for cohorts admitted to treatment from 1969 to 1971 and from 1971 to 1972 and 69 percent for the cohort admitted in 1973 to 1974.

[b]TOPS, a federally funded national multimodality study, began in 1979. Results pertain to the 45 percent of clients who stayed in treatment at least 3 months. The average response rates for a sample of 1,282 clients, regardless of time spent in treatment, were 88 percent for the year before treatment and 81 percent for the year after treatment.

[c]Study conducted at Phoenix House, one of the largest traditional therapeutic communities in New York City. A sample of 1974 to 1975 admissions was followed and results pertain to both graduates and dropouts. The followup rate was 67.1 percent.

[d]Daily opiate use for DARP, weekly or more frequently for TOPS, and daily use for the Phoenix House study

[e]Criminal activity refers to any arrest during one's lifetime before treatment or in the year following treatment in the DARP study; self-reported involvement in predatory crimes, excluding crimes related directly to drug use, in the TOPS study; and at least one episode of criminal activity during any month of observation in the Phoenix House study.

[f]Employment refers to employment half-time or more during the year before treatment or during the year after treatment in the DARP study, and to full-time employment in the TOPS study, and to employment full-time for at least 50 percent of employable months in the Phoenix House study.

SOURCE: De Leon, (76); Hubbard, Marsden, Rachal, et al. (149); Simpson and Sells (272).

It should be noted, however, that TCs' contribution is clouded by high dropout rates among the clients. Approximately 30 to 50 percent of those who enter leave within the first 30 days. Overall, the retention at 1 year is between 15 and 25 percent, and actual completion rates for programs of 18 to 24 months range from 10 to 15 percent (75). This limited ability to retain clients is related to the rigorous, demanding, and confrontational nature of the TC environment. Apparently, retention rates reflect considerable self-selection by clients. At least in the early 1980s, TC residents had more severe problems than clients in methadone maintenance and ODF programs (149). This factor may influence the size and the direction of the observed treatment effect and retention rate. Measured improvements in drug use, criminal activity, and employment have also been observed in 30 to 35 percent of individuals who leave treatment without completing the 18 to 24 months planned duration (76,80).

The consistency and magnitude of the results is consistent with the effectiveness of TCs in reducing drug abuse among its clients. It is difficult, however, to interpret the evidence. Given the high dropout rates and lack of an external comparison group, one cannot rule out the possibility that some would have improved without treatment or that those who remained and improved were unusual in some way. Based on available evidence and their knowledge of drug abuse patterns, many experts in this area have concluded that TCs in fact reduce heroin and cocaine use (33,75,76,77,84,149,248). But until further studies address the outstanding methodological problems, OTA cannot come to a firm conclusion regarding the relative contribution of TCs to reducing heroin and cocaine abuse.

Outpatient Drug-Free Programs--ODF programs represent a diverse collection of programs with little uniformity, whose common denominator is their drug-free philosophy and outpatient nature. They vary from casual drop-in centers and recreational facilities to highly demanding daytime programs with structures similar to TCs.

The majority of ODF clients do not use drugs intravenously; in 1987, only 17 percent were IV drug users (332). Among ODF clients in a national study (TOPS) who remained in treatment at least 3 months, only 8.6 percent used heroin the year before treatment, and 4.9 percent the year after treatment (see table 1-3) (149). Similarly, 12.8 percent reported cocaine use a year before and 8.1 percent

Table 1-3--Percent Self-Reported Outcomes by Clients in Outpatient Drug-Free Programs, Selected Studies

Category	DARP[a]		TOPS[b]	
	Before treatment	Year after treatment	Year before treatment	Year after treatment
Opiate use[c]	100	44	8.6	4.9
Cocaine use[c]	NA	NA	12.8	8.1
Criminal activity[d]	87	34	33.5	18.7
Employment[e]	24	52	27.1	38.5

[a]DARP, the first federally funded national multimodality study of treatment effectiveness, began in 1969. Findings refer to white and black males only. Data refer to all clients who were admitted to treatment, regardless of the length and time spent in treatments. Average followup rates were 77 percent for cohorts admitted to treatment from 1969 to 1971 and from 1971 to 1972 and 70 percent for the cohort admitted in 1973 to 1974.

[b]TOPS, a federally funded national multimodality study, began in 1979. Results pertain to the 36 percent of clients who stayed in treatment at least 3 months. Average response rates for a sample of 1,449 clients, regardless of time spent in treatment, were 72 percent for the year before treatment and 82 percent for the year after treatment.

[c]Daily opiate use for DARP and weekly or more frequently for TOPS.

[d]Criminal activity refers to any arrest during one's lifetime before treatment or in the year following treatment in the DARP study, and self-reported involvement in predatory crimes, excluding crimes related directly to drug use, in the TOPS study.

[e]Employment refers to employment half-time or more during the year before treatment or during the year after treatment in the DARP study, and to full-time employment in the TOPS study.

SOURCE: Hubbard, Marsden, Rachal, et al. (149); Simpson and Sells (272)

the year after treatment By the end of the fourth week, however, 36 percent of clients admitted to ODF programs in the TOPS study had dropped out, and by the end of the first year, 86.6 percent had discontinued treatment (149,150).

To interpret the treatment results from ODF programs, several considerations should be kept in mind. People attracted to ODFs compared with other modalities may have less severe problems and better societal functioning and be more amenable to change (149). Moreover, because of the great variety in ODF program content and the absence of a standardized treatment process, conclusions regarding ODF effectiveness may be more tentative than for the other modalities. Research to compare ODF programs requires more systematic data and exploration of organizational elements that may contribute to treatment effectiveness.

IMPLICATIONS OF THE FINDINGS

Reaching People Not in Treatment

Policies to control HIV infection must recognize that most IV drug users are not in treatment. Only 10 to 20 percent of the estimated 1.1 to 1.8 million IV drug users in the United States are in treatment at any time (216a,307,332a). By implication, as many as 1 million or more individuals are engaging in behaviors that place them at high risk for contracting or transmitting HIV. From mid 1988 to early 1989, among IV drug users not in treatment, 69 percent of the women and 75 percent of the men who volunteered information on all risk factors were rated at high risk of HIV infection (325). These high-risk people reported engaging in three risky behaviors: sharing needles, using rented or borrowed needles, and not using bleach to clean their needles.

In demonstration projects conducted since 1987, NIDA has used community-based outreach workers to study interventions to reduce risky behaviors among drug abusers not in treatment (341). From 1987 to 1989, substantial proportions of IV drug users not in treatment in certain U.S. cities reported decreasing IV drug use, from 49 percent in San Francisco to 75 percent in Miami. Similarly, high proportions also reported decreases in sharing or borrowing injection equipment (341). In another outreach program in San Francisco, IV drug users followed needle hygiene 13 percent of the time in 1986, but 80 percent of the time in 1989 (362). It should be noted, however, that reported reductions in sexual risk behaviors occurred to a lesser degree than drug-associated risk behaviors (341).

Outreach programs have demonstrated the feasibility of reaching people who have traditionally been difficult to contact. Compared with periods before treatment, program participants increased entry into treatment and reduced high-risk behaviors. But given other influences in the community, the relative contribution of the outreach programs to changes is not clear.

These outreach programs have compared behaviors reported by IV drug users randomly assigned to a standard intervention v. an enhanced intervention, which includes more intensive counseling and education (38). At the 6-month followup in two Ohio cities, the frequency of sharing injection equipment, use of shooting galleries, and use of speedball (heroin and cocaine combined) were significantly lower, and the use of bleach to disinfect injection equipment was significantly higher among those receiving the enhanced intervention.

In light of the large number of IV drug users continuing risky behaviors, it is desirable to explore a variety of settings to reach them, such as public health clinics, free-standing HIV counseling and testing programs, correctional facilities, and health-care facilities (341). Opportunities available through drug treatment have not been realized. Although IV drug users are at high risk for HIV infection, in 1989 only 3.5 percent of HIV counseling and testing sites were located in drug treatment centers. In New York City only 13 out of 713 drug treatment centers (approximately 2 percent) provide HIV counseling, testing and partner notification (350).

Despite the desire to enter treatment, some drug abusers cannot do so because space is not available (239,307). In September 1989, facilities for drug abuse clients were operating at close to 80 percent of budgeted capacity (332a). Utilization rates vary by State, public v. private program, for-profit v. not-for-

profit status, and inpatient v. outpatient setting (44a). For example, in October 1987, rates ranged from as low as 28 percent in South Dakota to 98 percent in New York and 109 percent in Puerto Rico and from 88 percent in public State and local units to 61 percent in private for-profit units. Financial barriers also impede treatment for drug abuse. Research has shown that when financial barriers are reduced, drug users who have never been treated seek to enter treatment (341).

Waiting lists and the unavailability of treatment should not be allowed to serve as deterrents to seeking help. Although motivation for entering treatment may vary among abusers, providing treatment achieves the clear benefit of being in contact with drug abusers and exposing them to the benefits of treatment. Subsequent interaction between client and treatment may enhance motivation to stay in treatment. Exposure to treatment may have a positive effect even for those who eventually drop out, since previous treatment episodes may exert a cumulative beneficial effect on the individual. Thus, contact with the drug abusing client in a controlled environment, if effectively utilized, presents tremendous opportunities to both prevent HIV infection and reduce illicit drug use.

Improvement in Quality

Currently, there is shared concern by experts in the field about deterioration in the quality of existing programs, especially among methadone maintenance programs (59,67). The services provided in various drug treatment centers in the United States are by no means uniform. Even within the same modality, differences exist in the number, type, and training of staff and the existence of medical, psychological, vocational, and rehabilitative services. Furthermore, the mere provision of these services is not synonymous with quality, as the way they are provided is also important.

Regulations of the Food and Drug Administration (FDA) and NIDA that set minimum requirements for the use of methadone are not always enforced (FR 54(10):8954-8971, March 1989) (67,299). These regulations are mandatory for any organization dispensing methadone, regardless of whether the program accepts public funding. The regulations address a variety of issues, such as minimum standards for admission, guidelines for patient evaluation, and minimum standards for the services provided (counseling, vocational, rehabilitative and other social and support services).

These regulations do not ensure, however, that the patient receives an individually determined and medically appropriate dose. This problem has been well recognized. In 1988, AIDS experts in the Public Health Service recommended that Federal methadone regulations be revised to provide more flexible and tailored patient care (307). Both the Public Health Service and the Presidential Commission on the HIV epidemic also recommended establishing quality-of-care guidelines for methadone maintenance and other drug treatment programs (239,307). Besides methadone dose, other components of treatment, such as a case management approach, individual assessment of co-morbidity and severity of addiction, and program staffing and structure, may be related to increased effectiveness (67).

The Methadone Maintenance Quality Assurance System, a new project initiated by NIDA, will collect and publish standardized data from all the methadone maintenance clinics on urine testing and retention by the client's severity and treatment duration (323). These data will allow methadone maintenance programs to be compared and States to make licensing, inspection, and funding decisions (323).

The Presidential Commission on the HIV epidemic has recommended that the scope of programs to treat drug abuse should be expanded to respond to the HIV epidemic (239). These recommendations are supported by the current complexities of drug abuse patterns and the belief that a more comprehensive approach to drug treatment may be needed to effectively address the many problems that drug abusers face. To be effective in reducing drug use and HIV transmission, treatment programs need to recognize and address the high prevalence of multiple drug use, psychiatric comorbidities, other social deficiencies, and the interaction of these factors.

Future Research

During the past 30 years, research on drug abuse treatment has evolved gradually from anecdotal, uncontrolled studies with poor study methods to studies that attempt to conform more closely to research principles. Advances in the sophistication of study design and data analysis will allow future research to address issues that so far have not been adequately researched.

Overall, high quality studies are needed on ways to improve treatment effectiveness and efficiency. It is important to be able to dissect treatment programs to identify their most effective components and to determine which components are most effective for various client groups. With the exception of methadone maintenance for opiate abusers, the relative effectiveness of approaches for different patients and drugs has not been subjected to rigorous analysis. More information is needed on the process of recovery from drug abuse, both natural and treatment-assisted. Better understanding of the natural history of drug abuse would help in designing interventions and evaluating them. Ultimately, research on drug abuse treatment should lead to what has been a common practice in medicine, namely a case management approach with an individually tailored plan to maximize the likelihood of treatment effectiveness.

Knowledge about the relative effectiveness of different programs is also important because of the implications for the cost of treating drug abuse. As outpatient approaches, ODF and methadone maintenance programs do not entail the costs of inpatient or residential care. In 1987, annual operational costs per patient position were estimated to be $3,000 for methadone maintenance, $2,300 for ODFs, and $14,600 for TCs (217). To assess the cost-effectiveness of these interventions, however, requires information about the relative effectiveness of these programs and their respective costs for different types of patients and drugs.

The development and evaluation of techniques to prevent relapse is of crucial importance because of the chronic relapsing nature of drug abuse. The development of medications to assist recovery from drug abuse is essential, especially with regard to cocaine and crack, drugs whose increasing use is linked to high HIV risk through both IV use and sexual practices.

Federal research underway is addressing many of these areas. NIDA is funding studies to evaluate different approaches to treating cocaine abuse and different interventions to reduce the risk of HIV exposure, especially among African-Americans and Hispanics (327a). Some of this research involves controlled trials. Research is assessing treatment components, such as relapse prevention, behavioral techniques, family therapy, and support groups. Substance abuse treatment among women is also being studied. Other areas covered include improvement in methods to study drug abuse and to enhance the data collection in different States.

Improving technical assistance, to support technology transfer in the field of drug abuse and to encourage implementation of quality assurance mechanisms in treatment is part of the mission of the Federal Office for Treatment Improvement, which was created in January 1990 (332b). This Office is also supporting projects to reduce waiting lists for drug abuse treatment. For fiscal year 1990, it planned to provide grants for treatment improvement demonstration projects in metropolitan areas; for critical populations, such as racial and ethnic minorities, adolescents, and residents of public housing projects; and for criminal justice populations.

It should be noted, however, that the fruits of these efforts will not materialize unless larger numbers of abusers are willing or able to enter and remain in treatment. Thus, research to increase recruitment and retention in treatment is also essential.

CONCLUSIONS

Methadone maintenance is clearly efficacious in reducing opiate use and associated IV use of heroin. Its effectiveness, however, may sometimes be compromised by inadequate doses of methadone. Philosophical and political differences about the use of methadone, such as concerns about substituting one

opiate for another and fears of illegal diversion, have inhibited administration of adequate methadone doses. As a result, methadone's potential to prevent HIV is probably not being realized.

Although methadone is effective for opiate use, it is not a treatment for abuse of cocaine, a pharmacologically different drug. No clearly efficacious treatment for cocaine, whose use in IV and smokable forms is associated with behaviors at high risk of transmitting HIV, is yet available.

Research findings are consistent with the effectiveness of TC and ODF programs. Compared with results for methadone maintenance programs, interpretation of these results is more difficult because low percentages of clients remain throughout the treatment program and the studies lack external control groups. The possibility thus remains that clients who stayed throughout these programs may have improved without treatment. On the other hand, the possible contribution of treatment in assisting these individuals should not be overlooked.

Treatment for drug abuse is not a panacea. Not even methadone maintenance eliminates drug abuse for all clients. Yet any continued sharing of injection equipment or risky sexual behavior associated with drug use places people at risk for HIV transmission. Such a risk is substantial for frequent drug users (abusers and addicts) and smaller but still present for casual users.

Even if treatment for drug abuse is not 100 percent effective, it may markedly decrease drug use for extended periods, and, therefore, decrease the probability of HIV transmission. It should be emphasized that when these interventions are applied on a very large scale, to hundreds of thousands of people, the public health impact of an intervention with even limited effectiveness can be substantial.

Drug abuse, a condition with a long course characterized by relapses to drug use, occurs in people with a variety of other problems, such as psychiatric and non-psychiatric illnesses and family, financial, employment, and legal difficulties. Recovery from drug dependence is not an overnight event, but a dynamic process that occurs over time. The road to recovery may require multiple treatment episodes, with approaches tailored to the needs of different people. Moreover, the treatment needs of an individual and the appropriate interventions may change over time. Responding to these realities, experts advocate an integrated, comprehensive, flexible treatment network (11,149,169,241a).

The United States is confronted with an ongoing epidemic of HIV infection, whose control requires consideration of the medical and epidemiologic characteristics of the disease. Strategies to prevent HIV infection must acknowledge these complexities. Preventing further spread of HIV increases the pressure for reexamination and scientific evaluation of public policies with regard to the availability of syringes and needles. Temporarily providing methadone and counseling, without the additional ancillary services ordinarily part of methadone maintenance, to IV opiate users who are on waiting lists for treatment merits strong consideration.

Only consistent and persistent efforts over time have the potential to break the chain of HIV transmission and stem this lethal infection from spreading further. The impact of incremental, even partial, but sustained reductions due to methadone maintenance and perhaps other drug treatment approaches can be substantial in achieving this goal.

Chapter 2

Drug Use and HIV Infection: The Current Situation

INTRODUCTION

Reliable estimates of the nature and extent of the drug abuse problem in the United States are vital to the formulation of an effective national drug control policy. Some of the estimates important to policymaking are current rates of drug use and trends in use, specific populations and age groups at risk, and major health consequences associated with drug abuse. Data on trends in drug usage help provide useful information on the natural social course of drug epidemics and the effectiveness of Federal anti-drug efforts. Data collectors face certain barriers, however, including the illegal nature of drug use, which leads to questions of the reliability of self-reported drug use, and the difficulty reaching certain populations with standard survey techniques, including homeless people and people not in school.

The connection between intravenous (IV) drug use and human immunodeficiency virus (HIV) infection has added urgency to the need to combat drug abuse. IV drug abuse has been described as the "engine of the current HIV epidemic," because equipment-sharing and certain sexual practices of IV drug users constitute high-risk behavior for HIV transmission (145). The acquired immunodeficiency syndrome (AIDS) epidemic, which runs about 5 to 10 years behind the HIV epidemic, has also shown a growing proportion of IV drug users among new cases. IV drug users now account for one-third of all AIDS cases and are the second highest risk category for AIDS, exceeded only by homosexual and bisexual males (349). Non-IV drug use has also been connected to the spread of HIV infection through sexual transmission. Cocaine use, especially in the form of crack, has been linked to increased sexual activity, multiple partners, and an increased likelihood of spreading the virus to drug-using and nondrug-using sexual partners. Understanding the links between drug abuse and HIV infection and the magnitude of the problem is a necessary first step in determining the best strategy for reducing the spread of HIV among drug users.

This chapter describes of the use of illegal drugs in the United States, with a focus on heroin and cocaine because of their frequent IV administration and connection with HIV transmission. A discussion of measurement issues associated with drug abuse and an overview of rates and trends in use are also provided. The chapter then addresses the critical link between drug use and HIV infection, including a discussion of the routes of HIV transmission; estimates of the number of IV drug abusers, risk behaviors, and prevalence of HIV-infected drug abusers; and a review of AIDS cases reported to the Centers for Disease Control. The chapter concludes with a brief discussion of the cost of drug abuse to society.

USE OF ILLEGAL DRUGS IN THE UNITED STATES

Substance Dependence, Substance Abuse, and Casual Use

Substance dependence, substance abuse, and casual use are three categories that are often used to classify the use of illegal drugs. Patterns of psychoactive substances use actually fall along a continuum, ranging from experimental, occasional, and recreational use to abuse and dependence. Defining these terms and developing treatments have been particularly difficult because the causes and consequences of drug use vary so extensively with the substance used, the user, the dose, the route of administration, and the social circumstances of initial and sustained use (133).

The concept of addiction has undergone many revisions, from theories of personal responsibility in the early 1900s to an appreciation of environmental and societal influences in the aftermath of the Depression and World War II and a theoretical preference for physiological explanations of addiction during the 1970s and early 1980s (including genetic and chemical predispositions) (266). With the increasing problem of cocaine abuse, the concept of addiction has more recently evolved to a concept of

the "dependence syndrome." As Shaffer and Jones note, the World Health Organization's emphasis on a syndrome of dependence "recognizes the inefficiency and futility associated with trying to determine the distinction between psychological and physiological dependence" (266). The dependence syndrome concept incorporates quantitatively defined patterns of behavior, neuroadaptation (as evidenced by tolerance or withdrawal syndrome), and psychological drug craving or dependence (266). Although the American Psychiatric Association's first two diagnostic manuals classified drug dependence and alcoholism as personality disorders, it has now "become clear that there is no single type of addictive or dependence-prone personality, no personality traits that reliably indicate in advance who is likely to use or misuse drugs" (134).

In its latest Diagnostic and Statistical Manual for Mental Disorders (Third Edition Revised) (DSM-IIIR), the American Psychiatric Association defined psychoactive (mind-altering) substance dependence as "a cluster of cognitive, behavioral, and physiologic symptoms that indicate that the person has impaired control of psychoactive substance use and continues use of the substance despite adverse consequences" (6). According to the American Psychiatric Association's substance dependence criteria, at least three of the nine characteristic symptoms of dependence must be present for diagnosis (box 2-A). Some of these symptoms include failed attempts at controlling excessive drug use, substantial time spent procuring the substance (including theft, taking the drug, and time recovering), and a variety of social, psychological, and physical problems. Symptoms of the

Box 2-A--American Psychiatric Association's Diagnostic Criteria for Psychoactive Substance Dependence

At least three of the nine characteristic symptoms of dependence (below) are necessary to make the diagnosis of substance dependence (6). In addition, some symptoms of the disturbance must have persisted for at least 1 month or have occurred repeatedly over a longer period of time.

Symptoms of dependence:

1. substance often taken in larger amounts or over a longer period of time than the person intended;
2. persistent desire or one or more unsuccessful efforts to cut down or control substance use;
3. a great deal of time spent in activities necessary to get the substance (e.g., theft), taking the substance (e.g., chain smoking), or recovering from its effects;
4. frequent intoxication or withdrawal symptoms when expected to fulfill major role obligation at work, school, or home (e.g., does not go to work because hung over, goes to school or work "high," intoxicated while taking care of his or her children), or when substance use is physically hazardous (e.g., drives when intoxicated);
5. important social, occupational, or recreational activities given up or reduced because of substance use;
6. continued substance use despite knowledge of having a persistent or recurrent social, psychological, or physical problem that is caused or exacerbated by the use of the substance (e.g., keeps using heroin despite family arguments about it, cocaine-induced depression, or having an ulcer made worse by drinking);
7. marked tolerance: need for markedly increased amounts of the substance (i.e., at least a 50 percent increase) in order to achieve intoxication or desired effect, or markedly diminished effect with continued use of the same amount;
8. characteristic withdrawal symptoms (see specific withdrawal syndromes under Psychoactive Substance-induced Organic Mental Disorders);
9. substance often taken to relieve or avoid withdrawal symptoms.

dependence syndrome include, but are not limited to, the physiologic symptoms of tolerance and withdrawal. Symptoms of tolerance[1] occur when the same amount of a particular drug produces less effect. This often leads the individual to take increasingly larger or more frequent doses of the drug in order to obtain the effect of the original dose. Withdrawal symptoms can result either when users come down from an acute intoxication or when regular users of heavy doses stop taking the drug entirely (abstinence syndrome).

Psychoactive substance abuse is a subset of drug dependence. Substance abuse is characterized by maladaptive patterns of behavior that have not met the American Psychiatric Association's criteria for dependence. Indicators of maladaptive patterns associated with substance abuse include evidence of continued use despite knowledge of persistent or recurrent social, occupational, psychological, or physical problems caused or exacerbated by drug use, or recurrent use in situations in which use is physically hazardous (e.g., driving while intoxicated) (6). Some symptoms must have persisted for at least 1 month or have occurred repeatedly over a long period to support a diagnosis of substance abuse.

Finally, casual or recreational use includes users who take certain drugs only occasionally or in low to moderate doses and can usually stop without formal intervention (e.g., treatment) when the dangers begin to outweigh the advantages. Casual users do not exhibit the seriously maladaptive patterns of drug consumption and resultant behaviors associated with substance dependence or substance abuse. They may be at risk, however, for health problems and later developing substance dependence (238).

Dependence has also been defined by the 3-Cs: continued use in the face of adverse physical or psychic reactions; compulsion to use drugs; and feeling of being out of control regarding drug use (266). Other researchers stress the inability to remain abstinent as a primary indicator of dependence (226). Studies have shown that heavy use of certain drugs (including opiates, amphetamines, and cocaine) is more likely to lead to dependence than others (133). In addition to individual biological differences, the route of administration of the drug is also an important variable in determining whether drug use will result in dependence. "In general, routes of administration that produce more rapid and efficient absorption of the substance into the bloodstream tend to increase the likelihood of an escalating pattern of substance use that leads to dependence" (6). For this reason, a person is much more likely to develop dependence on heroin or cocaine if they are smoked or taken intravenously than when they are sniffed or taken orally (see ch. 4). Once drug dependence develops, it often persists as a chronic condition, with relapse being the rule (13). Although the term addiction is often used interchangeably with dependence, addictive behaviors can be identified by the high frequency of their occurrence, not by the presence of physical dependence (266).

Drugs of Abuse

Accurate assessment and appropriate treatment of drug-using clients requires a working knowledge of the commonly used psychoactive drugs and their effects. Although almost all the currently used recreational drugs have been extensively investigated, drugs are continuously being used in new ways and in combination with different drugs. Understanding the distinctions among the various drug categories and being able to identify signs of intoxication, withdrawal, and overdose are essential, both for treatment and for data collection.

For medical and psychiatric purposes, commonly used drugs are often grouped into the following six categories, reflecting the primary action of each:

1. narcotics (opiates, including heroin) and related analgesics;
2. stimulants (including cocaine, amphetamines, nicotine, and caffeine);
3. sedative-hypnotics (including alcohol, barbiturates, non-barbiturate sedatives, and minor tranquilizers);
4. hallucinogens (including lysergic acid diethylamide (LSD));
5. phencyclidine (PCP); and
6. cannabis (marijuana) and inhalants.

[1]Although the degree of tolerance varies with the drug used and other circumstances, almost all drugs eventually produce tolerance for two reasons: 1) the liver produces more of the enzymes that break a drug down (metabolic tolerance), and 2) the brain becomes adapted to the new chemical environment created by the drug and no longer responds to it so intensely (central nervous system tolerance)(133).

Other classifications of drugs may vary from this one, depending on how broadly or narrowly the groups are defined. Distinguishing among drugs based on their effects may also be complicated by the fact that the intoxication effects of one drug (e.g., hallucinogen intoxication) may be quite similar to the withdrawal symptoms associated with another type of drug (e.g., the disorientation and hallucinosis associated with sedative-hypnotic withdrawal) (6). Diagnosis is further complicated by the use of multiple substances (polydrug abuse), often with a second drug being used to enhance the "high" or to counteract the lingering unpleasant effects caused by the first drug.

One common feature of all abused drugs is that they function as behavioral reinforcers. As the effects of the drug strengthen the behavior that leads to their administration, deeply-ingrained behavior may result over time (238). This view helps explain how experimenting with abused drugs can lead to drug dependence. In general, the effects of drug use can be either acute (resulting from a single dose or a series of short or episodic doses) or chronic (resulting from long-term use) and can affect physical, psychological, and social health (133).

Because it is primarily the route of drug administration that links drug use to HIV transmission and not the drug itself, the following discussion will focus on narcotics and stimulants because drugs in these categories (e.g., heroin, cocaine, and amphetamines) are associated with IV drug use and the spread of HIV infection. Sexual transmission of HIV has also been associated with the effects of the stimulant crack cocaine, which often lead users to engage in increased sexual activity and to have multiple sexual partners (193). A brief description of the patterns of use, effects of the drug, symptoms of use and withdrawal, and health consequences of narcotics and stimulants follows. (App. E describes comparable information related to the other drug categories.)

Narcotics (Opiates) and Related Analgesics

Narcotics, also called opiates, are a class of drugs used medically to relieve pain, but also have a high potential for abuse. Heroin accounts for the majority of the opiate abuse in the United States. The preference for injection as the primary route of heroin administration can lead to serious health consequences, most notably increased exposure to HIV through needle-sharing among IV drug users and other infections resulting from the use of contaminated apparatus (e.g., hepatitis, bacterial endocarditis, meningitis, and tetanus). Heroin is commonly sold in an adulterated form, "cut" with volume-expanding substances, such as quinine, that are known to cause toxic and allergic effects in some users. Another practice with dangerous consequences is the use of narcotics with other drugs, such as alcohol and cocaine.

Narcotics produce euphoria in users by activating the region of the brain responsible for producing pleasurable sensations (317). Several opiate receptors and endogenous neurotransmitters have been connected with opiate abuse and dependence and the development of tolerance to opiates (178). Within 2 to 5 minutes of IV opiate use, the user typically experiences euphoria that may last 10 to 30 minutes, followed by a longer period (2 to 6 hours) of lethargy, somnolence, and apathy (6). Constricted pupils, drowsiness, slurred speech, and impairment in memory and attention are also common symptoms of narcotic use. It is not uncommon for users to go "on the nod," going back and forth between feeling alert to drowsy. Regular use of narcotics can lead to high levels of tolerance.

The need for readjustment after drug withdrawal usually produces symptoms roughly opposite to the drug effect (133). With narcotics withdrawal, abusers generally become anxious and restless and experience symptoms of watery eyes, runny nose, loss of appetite, diarrhea, abdominal cramps, chills, sweating, and nausea. Although most users initially take heroin because it produces euphoria, subsequent use is often driven by the desire to avoid the painful consequences of narcotics withdrawal. As with all the drug categories, the health consequences of narcotic use depend on the specific drug used, the dosage level, and the mode of administration. In addition to the risk of HIV and other infections mentioned earlier, narcotics users may develop skin abscesses and congested lungs. Although uncomfortable, in the absence of complicating medical conditions, physical withdrawal from narcotics is usually not life threatening.

Opiate-dependent pregnant women are often debilitated and tend not to obtain perinatal care and to have inadequate nutrition. As a consequence they suffer more often from anemia, heart disease, diabetes, pneumonia, and hepatitis than nonusers, and they have more spontaneous abortions, breech deliveries, caesarean sections, premature births, and stillbirths (312). Unless the mother has been withdrawn from opiates, the infant is likely to experience withdrawal symptoms (neonatal abstinence syndrome) and to be below normal birthweight.

Central Nervous System Stimulants

Stimulants, often called "uppers," refer to drugs that tend to increase alertness and physical activity. Cocaine and amphetamines are the two most common of the central nervous system stimulants. Three neurotransmitters have been implicated in the psychoactivity and withdrawal from stimulants: dopamine, norepinephrine, and serotonin (178). Severely dysfunctional stimulant use occurs in episodic, prolonged binges that disrupt sleep rather than in the regular daily use patterns seen with opiate dependence (116). Ingestion of high doses of these drugs in nontolerant persons can produce effects ranging from enjoyable subjective states of euphoria to acute psychotic states, seizures, cardiovascular collapse, and death (166).

Cocaine stimulates certain neurons in the central nervous system and causes the user to experience a sense of pleasure. When taken intravenously, cocaine produces a characteristic "rush" of well-being, confidence, and in some cases, euphoria (6). The physical effects of cocaine use include dilated pupils and increases in blood pressure, heart rate, breathing rate, and body temperature (312). Cocaine overdose deaths are often the result of multiple seizures followed by respiratory and cardiac arrest.

Unlike heroin, cocaine has not been associated with a clear-cut withdrawal syndrome, but it is not uncommon for stimulant users to experience a marked period of depression, often referred to as "crashing," following a period of binging or cessation of drug use. Gawin and Kleber have identified a regular sequence of symptoms that occur in both the immediate and prolonged period after cessation of cocaine use and have classified the symptoms into three phases: the crash, withdrawal, and extinction phases (116). The crash phase, lasting from only a few hours to 4 days, is characterized by agitation, depression, anorexia, and high cocaine craving during the early stages, followed by fatigue, depression, insomnia, and no cocaine craving in the later stages. During the withdrawal stage, lasting from 1 to 10 weeks, sleep normalizes, but the potential for relapse increases as anxiety and cocaine craving increase. The final phase, extinction, lasts between 3 and 12 months, and relapse to cocaine use becomes more closely tied to environmental cues that stimulate cocaine craving (116).

Cocaine and its derivative "crack" have become a focal point of the U.S. drug problem in recent years. Crack is the street name for freebase cocaine that has been processed from cocaine hydrochloride to a base, using ammonia or baking soda and water and heating it to remove the water (316). Cocaine hydrochloride powder is sniffed or injected, while cocaine alkaloid ("freebase" or "crack") is smoked. Although average street-level purity of cocaine more than doubled from 1981 through 1986, prices for the drug declined, according to the Drug Enforcement Administration, indicating increased availability (298). Recent trends, however, show a sharp rise in cocaine prices, which are approaching their highest level since mid-1985, and a decline in cocaine purity levels at all levels of the distribution chain (46).

Maternal cocaine use is associated with poor pregnancy outcome. Maternal use of cocaine and crack may adversely affect the fetus either through the pharmacological action of the drugs (e.g., high blood pressure, reduced uterine blood flows resulting in lower fetal oxygen levels) or because of the mother's behavior while taking the drug (e.g., poor appetite, less likely to seek prenatal care) (301). Several studies have shown cocaine use during pregnancy to increase the risk of both pre-term delivery and intrauterine growth retardation (53,196,236,380). In a study of patterns of cocaine use in pregnancy, Chasnoff, et al., found that infants born to mothers who used cocaine (either during the first trimester only or throughout pregnancy) demon-strated significant impairment of orientation, motor skills, and

the ability to remain alert. Infants born to women who have used cocaine throughout pregnancy were also more likely to have low birthweights, decrements in length, and smaller head circumferences (53,236,380).

Like cocaine, amphetamines may produce feelings of euphoria and heightened energy. The physical effects of amphetamines include decreased appetite[2] and increased heart and breathing rates and blood pressure, and users usually report feeling restless, anxious, and moody. Both cocaine and amphetamines, when used in large doses over a long period of time, can lead to hallucinations and paranoia. When people stop using amphetamines, they may sleep for long periods and feel hungry, irritable, and depressed. Like narcotics, amphetamine use can slowly lead to high tolerance. Amphetamines are usually sold in tablet or capsule form, but users may also sniff the crystals or inject them.

Magnitude of the Drug Abuse Problem

Measurement Issues

Statistics on the drug problem are particularly difficult to compile and interpret (289,293). The primary measurement problem stems from poor self reporting, a consequence of the illegal nature of drug use. Finding survey respondents who are willing to participate and answer questions honestly, which in some instances requires admitting to illegal behavior, is a definite stumbling block. Two of the major methodological issues in the collection of data are validity (whether a variable measures what it purports to measure) and reliability (the consistency of measurement) (251). Reassuring respondents of the confidentiality and anonymity of their responses has been one means of increasing response rates and the validity of the data. Using drug testing to validate self reports is another. Significant progress has also been made in the past 2 decades in utilizing standard definitions and methodologies in drug surveys, thus making comparisons and integration of data more feasible (293).

[2]Amphetamines are often first taken for their appetite-suppressant effect in an attempt to lose weight.

Major Surveys on Drug Abuse

Information on the use of illegal drugs in the United States is based on a family of surveys that focus on drug use within a particular population (e.g., high school seniors) or at a particular setting (e.g., hospital emergency rooms). Some of the surveys overlap, and some populations, such as high school dropouts and homeless people, are difficult to reach and may go uncounted. Taken alone, none of the current studies provides a complete picture of drug abuse in the United States; however, when viewed together, these studies provide an overview of the drug problem and its evolution (289,293).

The two major national surveys of the prevalence of drug use are 1) the National Household Survey on Drug Abuse and 2) the High School Seniors/Monitoring the Future Survey (306,330). In addition, the Drug Abuse Warning Network (DAWN) provides useful data on drug-related hospital emergencies and deaths (328). Important features of each data source are highlighted below.

National household survey

- covers the general household population aged 12 years and older living in the continental United States;
- conducted every 2 to 3 years since 1971;
- sample sizes ranging from 3,186 (1971) to 8,814 (1988), half white and half evenly split between blacks and Hispanics;
- face-to-face interviews and self-administered written questionnaires;
- populations excluded: the homeless, military personnel living on base, and those in dormitories, hospitals, treatment centers, and jails;
- beginning with the 1985 survey, only one respondent was interviewed per household;
- questions respondents about their past drug use, attitudes, and consequences of drug use;
- conducted by the National Institute on Drug Abuse (NIDA's) Division of Epidemiology and Prevention Research.

High school seniors survey

- high school senior population (aged 17 to 18);
- conducted every year since 1975;
- sample size about 16,000 (130 to 140 public/private schools);
- self-administered questionnaire completed during class time;
- populations excluded include dropouts and absentees;
- through a longitudinal study of a subsample of each class, maturation factors associated with drug abuse are monitored (about 2,400 participants of each graduating class are chosen for followup study, half of the sample being surveyed continually on even-numbered years and half being surveyed on odd-numbered years);
- research is performed by the University of Michigan's Institute of Social Research and is funded largely by NIDA.

Drug Abuse Warning Network (DAWN)

- reports the consequences of drug abuse as reflected by emergency room (ER) episodes for drug-related problems and medical examiner reports of drug-related fatalities;
- ongoing since 1972;
- nonrandom sample of about 600 ERs in 21 metropolitan areas and on national panel (statistical sample being implemented in ERs);
- nonrandom sample of medical examiners in about 85 jurisdictions in 26 metropolitan areas;
- records mention of drugs being ingested up to 3 days prior to hospital ER visit;
- up to four different substances can be specified for each ER episode, and six substances can be reported for each death;
- conducted by NIDA's Division of Epidemiology and Prevention Research.

It is generally believed that both the household survey and the high school senior survey provide *conservative* estimates of the general level of drug use. In fact, neither survey purports to measure the nation's total drug-abusing population. Tomas and Kozel identify two reasons that the true level of drug abuse may be greater than these surveys indicate. The first reason is that the drug-abusing population is difficult to reach, especially through traditional survey techniques (293). Young males are the least likely group to be found at home to take the household survey, yet they are the highest age-gender drug-using group (293). The household survey also excludes residents of many places (prisons, jails, homeless shelters, and drug treatment centers) where one would expect to find greater prevalence of drug addicts (34). School dropouts who are missed by the high school seniors survey are also known to have higher drug use rates than nondropouts (293).[3] To the extent that this is true, the senior survey may underestimate the extent of drug abuse among this age group.

The second reason for possible underreporting with surveys on drug abuse relates to self-reporting methods. As mentioned earlier, certain respondents may be hesitant or unwilling to admit to illegal behavior or have trouble recalling specific times and drug use patterns (293,308). This would be particularly true of young respondents answering questions in the presence of a parent or teacher, even though answers to questions concerning illicit drug use are recorded on paper, not aloud.

It is also important to note that DAWN is not a representative sample, and therefore its data cannot be extrapolated to all the ER cases in the United States (293). Also, the number of ER episodes reported by DAWN should not be assumed to equal the number of individuals involved, since one person may make repeated visits to an ER (328). Incomplete reporting, despite specific procedures for identifying drug abuse episodes and reporting delays of up to 1 year for some medical examiners are two of DAWN's limitations. Also, there is no distinction made between licit and illicit drugs or drug use that is and is not believed to be related to the complaint. In other words, a stabbing victim will be reported if use of heroin, cocaine or legally dispensed methadone is reported, even if the stabbing had nothing to do with such use. To the extent that this occurs, it lessens the value of DAWN as a reflection of the true health consequences associated with drug use. Of particular relevance to this report is the fact that 1988 medical examiner reports exclude data on deaths involving AIDS.

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[3]According to the Digest of Education Statistics, 8 percent of the population aged 16 and 17 were not enrolled in school in October 1986, and in some urban sub-populations, up to 40 percent are not in school (305).

Box 2-B summarizes the purpose and administration of other major drug use information systems.

Data Gaps and Developments

The Public Health Service report on improving drug abuse statistics highlighted the need for additional prevalence data on school-based populations and special subgroups and hidden populations, such as heavy users and selected minority groups (308). Because "hidden" groups are difficult to reach through conventional survey methods, special approaches and targeted, smaller studies may be necessary (308). Because national estimates may mask the differences that occur among metropolitan areas, there is also a need for surveys of major metropolitan areas. The Public Health Service is currently involved in initiating several major data col-

Box 2-B--Other Information Systems on Drug Use

In addition to the household survey, the high school seniors survey, and DAWN, several other sources of information on drug use in the United States help give a more complete picture of the drug problem. Some of these include:

- National Drug and Alcoholism Treatment Unit Survey (NDATUS). Periodical survey of all known alcohol and other drug units since 1973. Information is collected on services available, funding sources, utilization rates, and client characteristics (see ch. 3).
- State Alcohol and Drug Abuse Profile (SADAP). Annual survey of State alcohol and drug abuse agencies conducted by the National Association of State Alcohol and Drug Abuse Directors since 1984. Collects information on funding and program and client characteristics for units that receive at least some funds administered by the State alcohol and drug agency (see ch. 3).
- Drug Use Forecasting program. The National Institute of Justice monitors drug use among recently arrested persons in selected cities. Staff obtain voluntary, anonymous urine specimens and interviews from a sample of arrestees in booking facilities in 22 cities throughout the United States. For most drugs, including cocaine and heroin, the urine test can detect use in the prior 2 to 3 days.
- Treatment Client Data System. This data system is composed of the remnants of the former Client Oriented Data Acquisition Process (CODAP). From 1973 to 1981 all treatment programs receiving Federal funds were required to report client admission data to NIDA. Following the Omnibus Reconciliation Act of 1981, which deleted various State reporting requirements including CODAP, only six States continue to share data with NIDA on client information.
- Community Epidemiology Work Group. Researchers from selected metropolitan areas of the United States meet semi-annually with NIDA staff, experts from European countries, and representatives from other interested groups to assess the drug abuse picture in their respective areas. The Community Epidemiology Work Group provides for the transfer of epidemiolic information that can identify new drug abuse patterns and trends and groups most likely to be affected.
- Military personnel survey. Office of the Assistant Secretary of Defense. Four waves between 1980 and 1988. Prevalence of drug use among military personnel worldwide.
- Hispanic Health and Nutrition Examination Survey. National Center for Health Statistics. One-time household survey, 1982 to 84. Included survey supplement from the Alcohol, Drug Abuse, and Mental Health Administration on use of drugs by Hispanics.
- National Maternal and Infant Health Survey. National Center for Health Statistics. National probability survey of registered births in 1988 (live births, stillbirths, and infant deaths before 1 year of life). Information on the use of tobacco, marijuana, and cocaine during pregnancy.

lection efforts. One such effort is the development of the Metropolitan Area Survey, a large-scale comprehensive study of prevalence, incidence, and consequences of drug abuse in the Washington, DC metropolitan area. This survey will be unique in its attempt to assess drug abuse in some "hidden" populations, including persons who are homeless, transient, chronically mentally ill, high school dropouts, and criminal offenders. The In Utero Drug Exposure Survey is another new initiative that will acquire data on the prevalence of prenatal exposure to all major drug types, the temporal patterns of that exposure, and the demographic characteristics of the exposed infants and their mothers.

An Overview of Drug-Use Rates and Trends

Any Illicit Drug--According to the 1988 household survey, 72 million Americans age 12 or older (37 percent of the population) have tried marijuana, cocaine, or other illicit drugs at least once in their lifetimes (330). Twenty-eight million (14 percent) had used some type of illicit drug at least once in the past year, and 14.5 million (7 percent) had used drugs within the 30 days prior to the administration of the survey (defined as current use). Demographic subgroups with elevated rates of current use include males (9 percent), those in large metropolitan areas (9 percent), those living in the West (10 percent), those employed part time (9 percent), and unemployed people (18 percent). Among the 20- to 40-year-old age group of full-time employed Americans, 12 percent were current users (10 percent used marijuana and 3 percent used cocaine, not mutually exclusive). Among the nearly 60 million women 15 to 44 years of age, the childbearing years, over 5 million (9 percent) were current users, almost 1 million (2 percent) having used cocaine within the previous month.

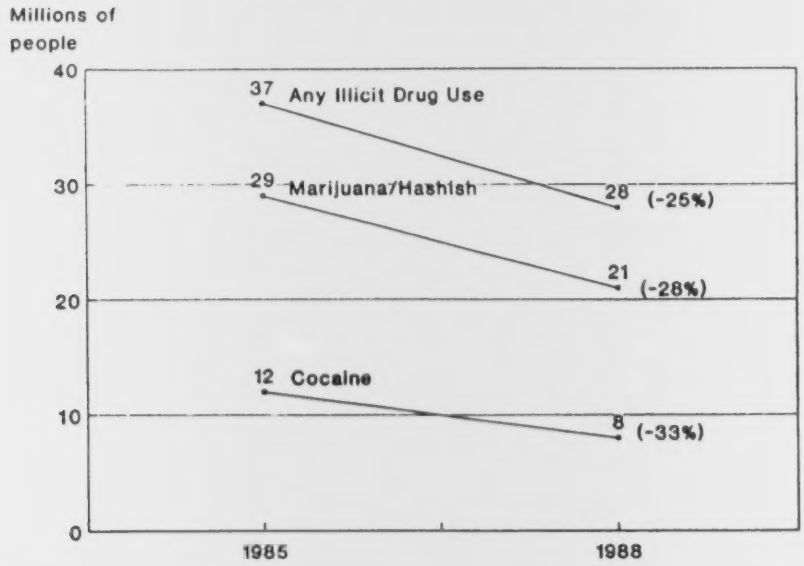
Statistics on current use of illicit drugs continued a declining trend that began in the early 1980s and accelerated between 1985 and 1988 (306). Comparison of the 1988 household survey with the previous 1985 survey shows a major decrease in illicit drug use noticeable in an almost 25-percent decrease in use of any illicit drug at least once in the past year (from 37 million to 28 million) and a 37-percent decrease in the use of any illicit drugs during the past month (from 23 million to 14.5 million) (see fig. 2-1 for trends in use of illicit drugs during the past year). The decline in current drug use between 1985 and 1988 was seen in all segments of the population--among both men and women; for all race and ethnic groups; throughout all regions of the country; and for all levels of educational attainment.

Figure 2-2 illustrates the trends in lifetime, annual, and current illicit drug use from 1975 through 1989 for high school seniors, all of which peaked during the late 1970s and early 1980s and have been steadily decreasing since (306). Between 1988 and 1989, annual use of illicit drugs among high school seniors decreased from 38.5 percent to 35.4 percent, and current use decreased from 21.3 percent to 19.7 percent.

Heroin--About 2 million household members (1.0 percent of the population aged 12 and older) have tried heroin in their lifetimes (330). Trends in the prevalence of lifetime use between 1985 and 1988 showed a decreasing trend among males and people in the 18 to 25 and 26 to 34 age groups, but increases for those in the 12 to 17 and $\geq$35 age groups, among blacks, and to a lesser extent, among Hispanics and among people living in the Northeast region (see figs. 2-3 and 2-4). The increase in heroin use during one's lifetime for 12 to 17 year olds reflects increasing use among young people, while increasing trends for people age 35 or older mean that use rates in their youth were high. Decreasing trends for 18- to 34-year olds mean use rates in youths were smaller a decade or 2 ago than they were before. According to the 1989 high school seniors survey, 1.3 percent of seniors had tried heroin at least once (306).

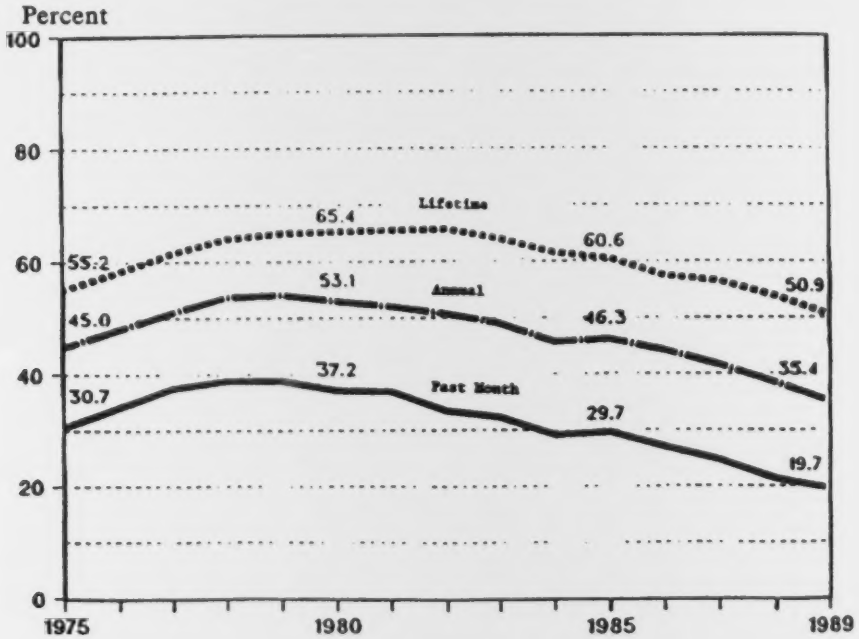
Although cocaine mentions increased dramatically as a percentage of the total ER mentions between 1984 and 1988, heroin mentions continue to account for about 13 percent of all ER mentions (see

Figure 2-1--Use of Any Illicit Drug During the Past Year, National Household Survey, 1985 and 1988



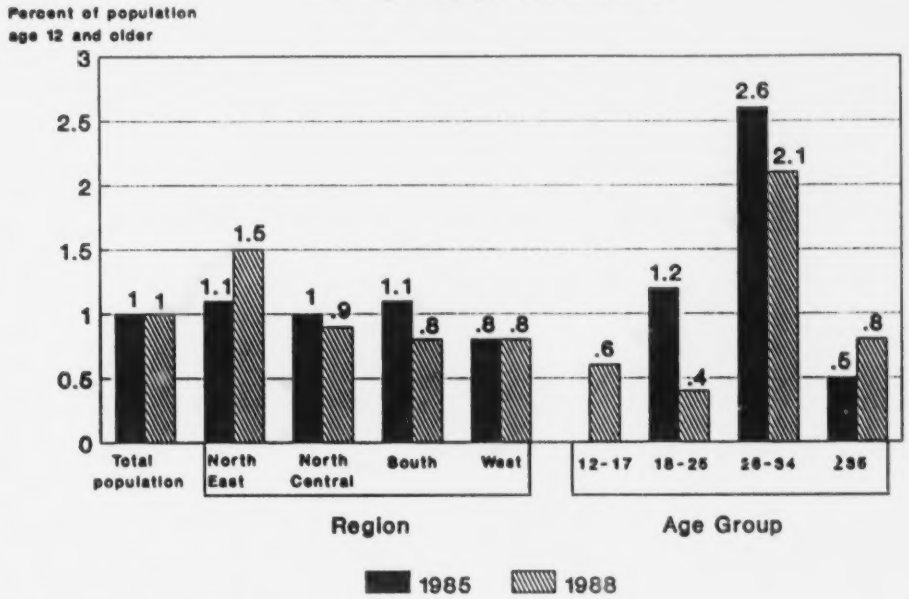
SOURCE: U.S. DHHS, NIDA (330,331).

Figure 2-2--Any Illicit Drug Use by High School Seniors, 1975 to 1989



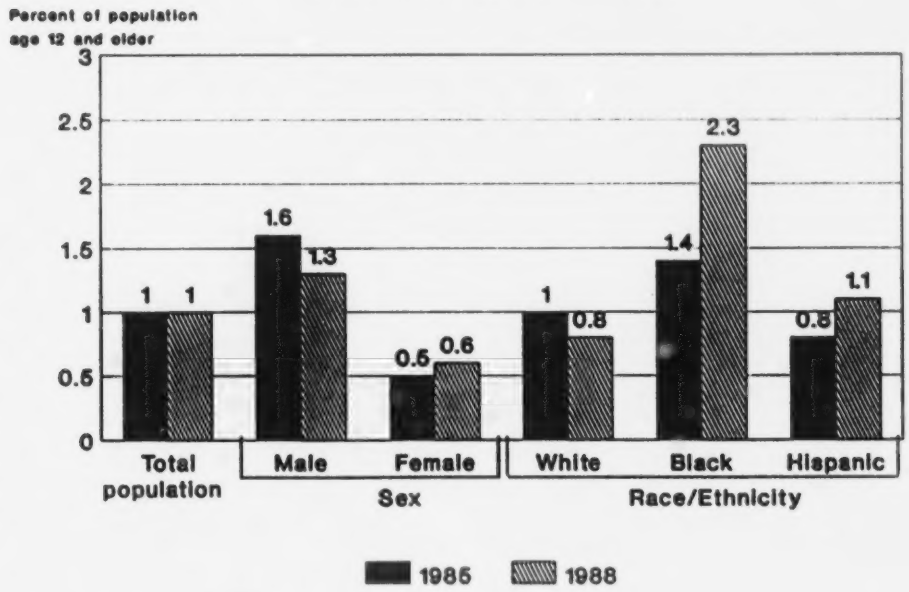
SOURCE: U.S. DHHS (306).

Figure 2-3--Percent of Population Reporting Heroin Use in Lifetime by Region and Age Group, 1985 and 1988



SOURCE: U.S. DHHS, NIDA (330,331).

Figure 2-4--Percent of Population Reporting Heroin Use in Lifetime by Sex and Race/Ethnicity, 1985 and 1988



SOURCE: U.S. DHHS NIDA (330,331).

fig. 2-5). The total number of heroin mentions increased 133 percent between 1984 and 1988, with 58 percent of that increase coming between 1987 and 1988 (see fig. 2-6).

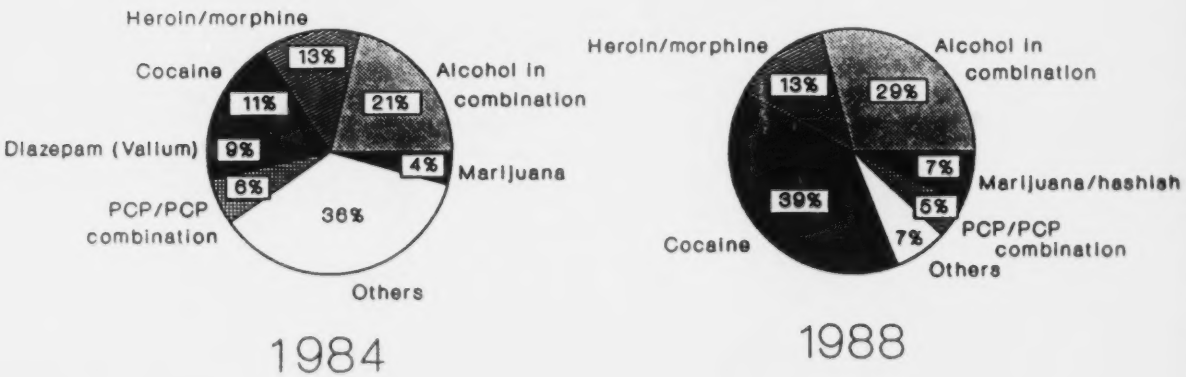
In 9 of the 14 cities included in a Drug Use Forecasting study in the first quarter of 1989, less than 10 percent of male arrestees had positive urine tests for opiates (see box 2-B for a description of this study) (336). Of those who tested positive for opiates, 81 percent also tested positive for cocaine.

Cocaine--An estimated 21.2 million people (11 percent of the household population aged 12 or older) have tried cocaine during their lifetimes, while 8.2 million (4.1 percent) have used cocaine at least once during the past year, and 2.9 million (1.5 percent) have used the drug at least once during the past month (330).

The number of household members who used cocaine within the past year dropped 33 percent between 1985 and 1988 (from 12.2 million to 8.2 million). The percent of household members reporting cocaine use during the past month decreased by about 50 percent between 1985 and 1988 for both males and females, with males still twice as likely to be current users as females (see fig. 2-7). Another noticeable trend between the 1985 and 1988 household survey was the increased prevalence of cocaine use among Hispanics. Although lifetime prevalence of cocaine use remained stable for whites and blacks, there was an increase among Hispanics between 1985 and 1988 (from 7 percent to 11 percent). The Hispanic population was also the only race/ethnic group that did not experience a decrease in current cocaine use during this period (see fig. 2-7).

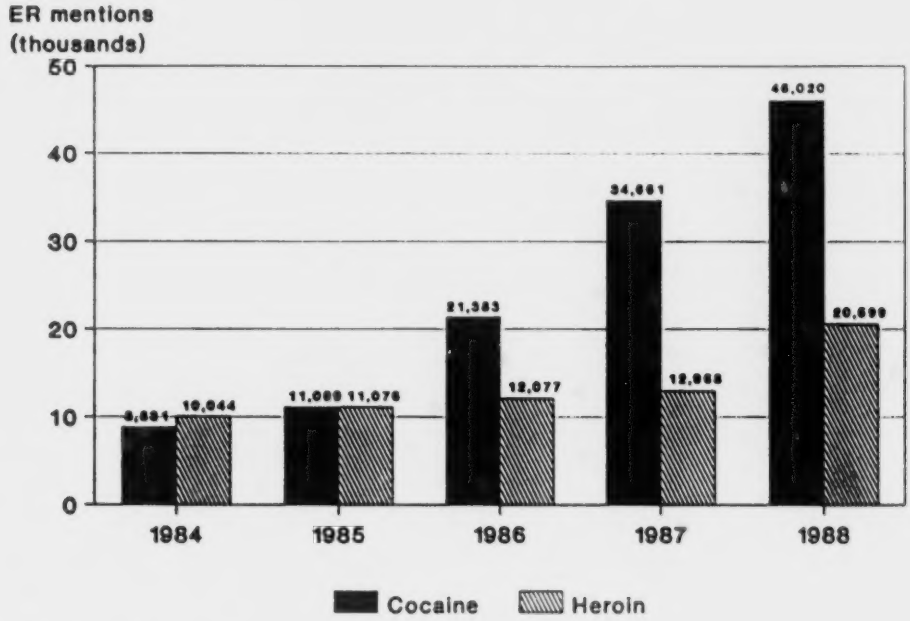
Despite the declining trend in the number of cocaine users, an increasing percentage used cocaine more frequently. Among the 8.2 million people who used the drug within the past year, in 1988 862,000 people (11 percent) used the drug once a week or more (compared with 5 percent in 1985), and 4 percent used the drug daily or almost daily (compared with 2 percent in 1985) (see fig. 2-8) (330, 331).

Figure 2-5--Drugs Mentioned Most Frequently in Emergency Rooms Episodes, by Percent of Total Episodes



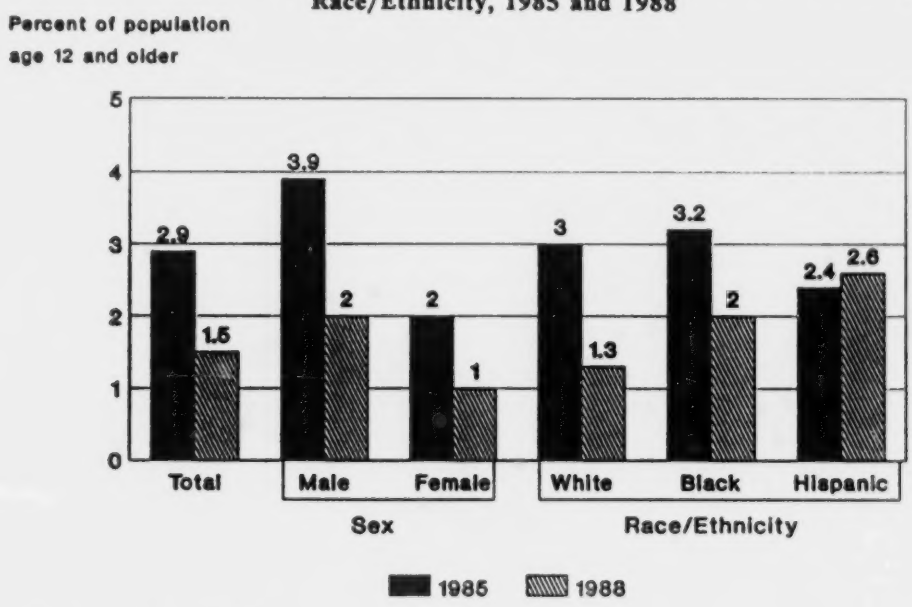
SOURCE: U.S. DHHS, NIDA (329).

Figure 2-6-Trends in Cocaine and Heroin Emergency Room (ER) Mentions 1984 to 1988



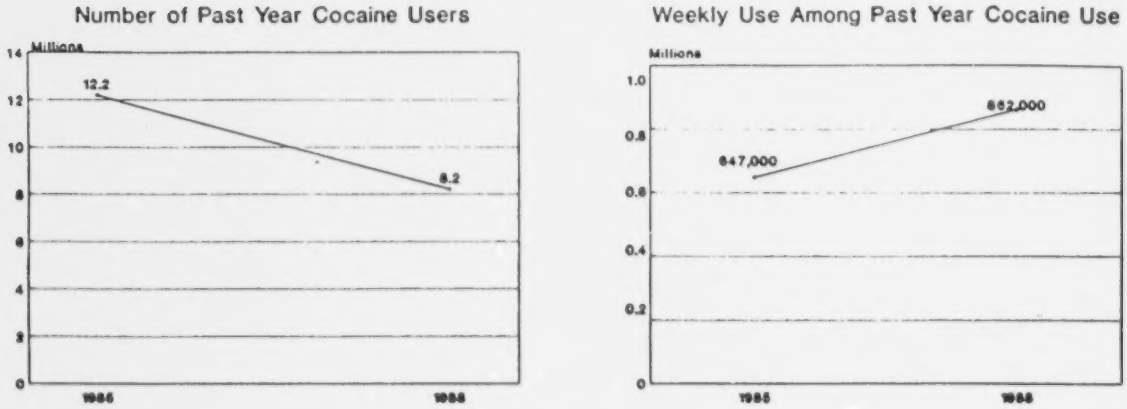
SOURCE: U.S. DHHS, NIDA (329).

Figure 2-7--Percent of Population Reporting Cocaine Use in the Past Month by Sex and Race/Ethnicity, 1985 and 1988



SOURCE: U.S. DHHS, NIDA (330,331).

Figure 2-8--Cocaine Users During Past Year, 1985 and 1988



SOURCE: U.S. DHHS, NIDA (330,331).

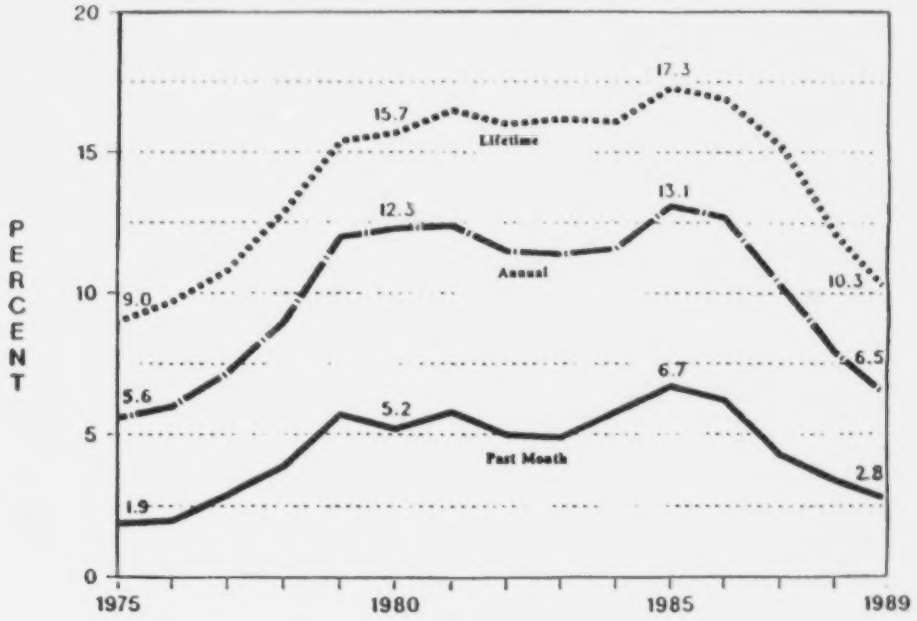
One noted limitation of the household survey is that it does not measure those who are arrested, homeless, or in treatment--places where one would expect to find disproportionate numbers of cocaine addicts (303). A recent staff report by the Senate Judiciary Committee, which attempted to take these "hidden" populations into account, put the total number of heavy cocaine addicts at 2.2 million about 2.5 times the number estimated by the 1988 household survey (303). Based on the estimate of 2.2 million heavy cocaine addicts, 1 out of every 100 Americans is a weekly user of cocaine (303). The Committee's estimate was based on four main sources of data including the nation's drug treatment centers, the homeless population, the criminal justice system, and NIDA's household survey. Most of the difference between the Committee's estimate and the household survey estimate comes from including an estimate of cocaine-using arrestees generated from the Drug Use Forecasting system of the National Institute of Justice (172). Although the Committee's estimate correctly emphasizes the need for better estimates of hard-to-reach populations, their means of deriving this estimate have been questioned and should be regarded with caution (146).

Figure 2-9 shows the trends in cocaine use among high school seniors between 1975 and 1989, illustrating the marked decline in cocaine use (lifetime, annual, and current use) since the peak in 1985. The percentage of high school seniors who have used cocaine at least once in their lifetimes dropped from 12.1 percent in 1988 to 10.3 percent in 1989 (306). Current use of cocaine also decreased from 3.4 percent in 1988 to 2.8 percent in 1989.

Even among young adults, the age group with the largest number of drug users, cocaine use was reported to decline over the past year. In the followup study of high school seniors who are now age 19 to 28, current cocaine use declined from 5.7 percent in 1988 to 3.8 percent in 1989, and use in the last year declined from 13.8 percent in 1988 to 10.8 percent in 1989 (306).

Although the declines in cocaine use over the past few years are encouraging, a note of caution in interpreting the survey results is warranted. The unreliability of self-reported declines in drug use, one of the methodological problems associated with underreporting, could exaggerate actual declines in

Figure 2-9--Cocaine Use by High School Seniors, 1975 to 1989

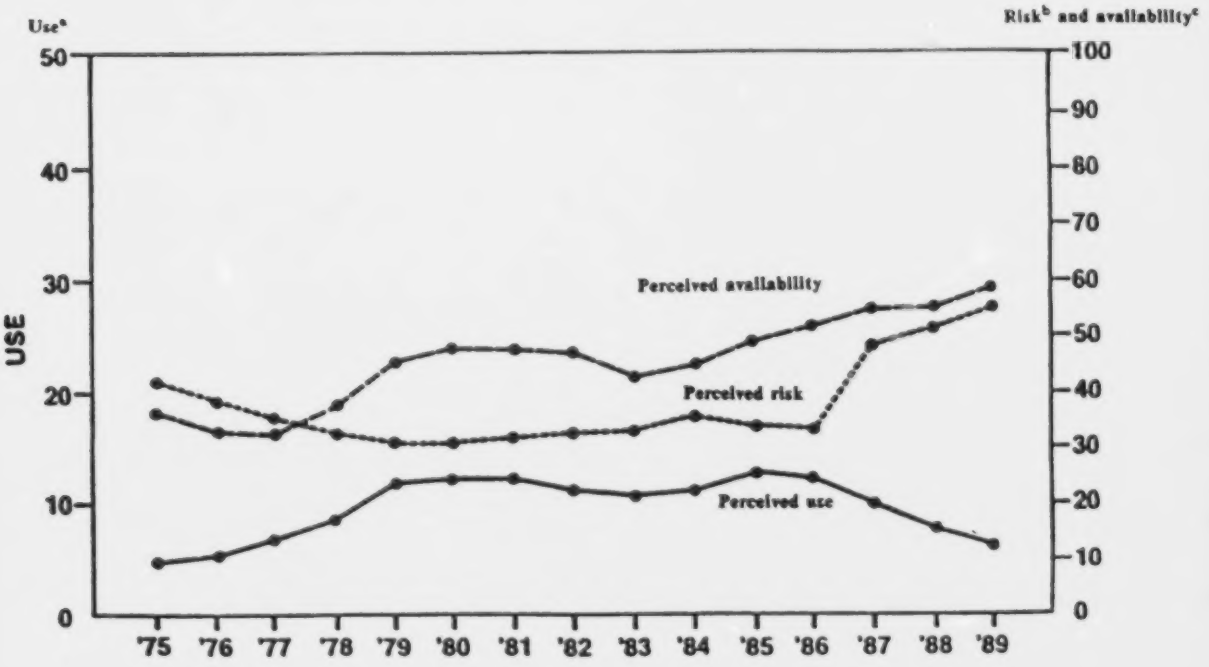


SOURCE: U.S. DHHS (306).

drug use. There may be reason to believe that self-reports are less reliable today than they were prior to 1986, given a dramatic change in the social climate toward illegal drug use. Kleiman notes that the size of the underestimate is probably growing and will continue to grow in conjunction with decreasing social tolerance for drug use and the continuing decline in the average social status of heavy cocaine users (172). As figure 2-10 illustrates, the perceived risk of cocaine use among high school seniors has increased dramatically since 1986, a trend that coincides with the cocaine-induced death of college basketball star Len Bias in the summer of 1986. The reported use of cocaine during the past year among seniors declined as the perceived risk of using cocaine once or twice increased (fig. 2-10). Although it is likely that the prevalence of cocaine use has declined as the major surveys show, it is also possible that a greater portion of those surveyed today are unlikely to report illegal drug use given the current social attitude.

Statistics reported by DAWN show that the drugs most frequently mentioned in ER episodes have changed dramatically in recent years (see fig. 2-5). Cocaine went from third with 11 percent of ER mentions in 1984 to first with 39 percent of ER mentions in 1988 (329). In 1985, cocaine surpassed heroin/morphine as the drug appearing most often in ER episodes (see fig. 2-6). The number of people admitted to hospital ERs following cocaine use, as reported by DAWN, increased more than fourfold over the 5-year period from 1984 to 1988 (from 8,831 cocaine mentions to 46,020 mentions) (table 2-1). Between 1987 and 1988, the total number of ER cocaine mentions increased 33 percent (from 34,661 to 46,020). The five metropolitan cities with the largest number of ER mentions of cocaine in 1988 include: New York (6,540), Washington, DC (5,221), Detroit (4,422), Philadelphia (4,156), and Chicago (3,907) (table 2-1). The trends in cocaine mentions varied by city. In New York and Los Angeles, the two metropolitan cities with the highest number of

Figure 2-10--Cocaine Trends in Past Year Among High School Seniors, 1975 to 1989



[a]Percent using once or more in past 12 months.
[b]Percent saying great risk of harm in using once or twice.
[c]Percent saying fairly easy or very easy to get.

SOURCE: U.S. DHHS (306).

cocaine mentions in 1984, the increase between 1984 and 1988 was relatively small. The cities with the greatest increase in cocaine mentions during this 5-year period include Dallas, Baltimore, Philadelphia, and Washington, DC (see table 2-1).

Cocaine was the most prevalent drug detected in male arrestees in the Drug Use Forecasting survey of 14 cities during the first quarter of 1989 (336). Urine tests positive for cocaine were most common in arrestees in New York (76 percent), Philadelphia (74 percent), and the District of Columbia (65 percent), and least likely in the smaller cities of Indianapolis (26 percent) and San Antonio (24 percent) (336).

Crack--According to the 1988 household survey, approximately 2.5 million (1.3 percent of the population aged 12 and over) have used crack at some time in their lives, 1 million (0.5 percent) in the past year, and 480 thousand (0.2 percent) during the past month (330). Data from the 1989 high school seniors survey report that 4.7 percent of seniors have used crack at least once in their lifetimes, and 1.4 percent have used the drug during the past month. The 1989 senior survey showed little change in lifetime, annual, and current use of crack from the 1988 data.

The DAWN network reported a stark rise in crack-related episodes from 549 in 1984 to over

Table 2-1--Trends in Hospital Emergency Room (ER) Mentions of Cocaine Reported to the Drug Abuse Warning Network (DAWN), by Metropolitan Area, 1984 to 1988

Years	New York	Washington, DC	Detroit	Philadelphia	Chicago	New Orleans	Los Angeles	Baltimore	Dallas	Seattle	Total[a]
1984	2,643	522	600	399	521	477	1,006	148	77	238	8,831
1985	2,944	793	992	570	714	501	1,606	221	157	246	11,099
1986	4,515	1,350	2,596	1,306	1,635	442	2,339	498	480	434	20,383
1987	6,486	3,182	4,633	2,670	2,817	1,907	2,248	962	985	839	34,661
1988	6,540	5,211	4,422	4,156	3,907	3,221	2,988	1,841	1,381	1,321	46,020
Percent change, 1984-88	+ 1.5	+ 9.0	+ 6.4	+ 9.4	+ 6.5	+ 5.8	+ 2.0	+11.4	+16.9	+ 4.6	+4.2

[a]Based on consistently-reporting ERs with at least 90 percent reporting in the first 12 months, the second 12 months, and the last 36 months. The metropolitan areas listed made up 76 percent of ER mentions made during the 1988 calendar year.

SOURCE: U.S. DHHS, NIDA (329).

15,000 in 1988 (329). In 1988, crack mentions represented 32.5 percent of cocaine mentions.

Heroin and Cocaine ("Speedballing")--Although there are few data on the prevalence and trends in the use of heroin and cocaine together, there is some indication of the trends in health consequences associated with this combination of drugs. DAWN ER episodes involving both cocaine and heroin increased almost 200 percent, from 2,646 mentions in 1984 to 7,748 mentions in 1988 (329).

DRUG USE AND HIV INFECTION

Routes of Transmission That Link Drug Use to AIDS

The association between drug use and HIV transmission is well established. Three modes of transmission link drug use and HIV infection. The transmission of HIV infection among IV drug users occurs primarily through the sharing of contaminated injection equipment. Sexual transmission of HIV from an infected IV drug abuser to his or her partner and from an infected mother to her baby are two other modes of HIV transmission connected with IV drug use. The multiplicity of transmission modes makes drug users and, especially, IV drug users critical groups in the spread of AIDS.

At the core of the problem lies the use of substances that can be administered intravenously. A distinction may be unwarranted between licit and illicit substances, because the intravenous use of anabolic steroids is also a potential vehicle for HIV transmission among groups such as adolescents and athletes who otherwise might not be at high risk for HIV infection. It should be emphasized that any form of IV drug use that involves the sharing of injection equipment has the potential for HIV transmission. It appears that the individual or combined use of two powerful and highly addictive illicit substances, heroin and cocaine (either injectable or smokable as crack) pose the greatest risk of HIV infection. Both of these drugs place users at increased risk of the equipment-sharing and sexual behaviors responsible for HIV spread.

Drug use practices vary throughout the United States, at least partly because of regional and cultural differences (26). The sharing of injection equipment, however, is a common practice throughout the country, in both low and high HIV seroprevalence areas (28). Various studies reported sharing rates between 70 and 100 percent (8). Injection equipment that may transmit HIV infection includes not only needles and syringes, but also other elements of the drug injection process, such as cotton, water, or the "cooker" used to mix the drug (26,174). Any contaminated blood remaining in the equipment can transmit the virus from one user to another. Both practical and economic reasons (limited availability of necessary tools) and social reasons (feeling of camaraderie and trust) are contributing factors to this well-established behavior in the drug abusers' subculture (26,174). "Shooting galleries," usually vacant buildings or alleyways, are common sites for such activities.

The other major avenue of HIV spread among IV drug users is through sexual transmission among IV drug users and to non-drug-using partners. It appears that a current epidemic of sexually transmitted diseases (STDs) facilitates further the spread of HIV (120,143). A recent report from two STD clinics in Baltimore showed that among heterosexuals who were not IV drug users, those who suffered from syphilis were seven to nine times more likely to have AIDS than other patients in the clinic (143). The increase in STDs is attributed to the increasing rates of cocaine use, both intravenously and in smokable form (crack) (260). Cocaine has been linked to increased sexual activity and multiple sexual partners (193). Furthermore, the exchange of sex for money or drugs is an additional force spreading HIV and other STDs (120,143).

The risk of contracting HIV infection from drug use relates to the user's needle-use behaviors and sexual practices. In both cases, the risk depends on the prevalence and infectiousness of HIV infection among the drug users or sexual partners. The risks associated with needle use depend on the number of persons sharing equipment, the use of rented or borrowed needles, the frequency of injection, and the frequency and effectiveness of needle-cleaning practices. The risk of HIV transmission through one needle-stick innoculation, which is comparable to one IV drug use, is estimated at about 0.4 percent (108a,200a). By sharing needles and injecting multiple times each day, IV drug users may frequently be exposed to HIV. The risks associated with sexual activity depend on the type of sexual practice, the number of partners, and the frequency of preventive measures, such as condom use. Research has estimated that the risk for HIV transmission through male-female vaginal intercourse is about 0.2 percent for each sexual encounter (141,145a). Researchers have noted that once HIV becomes established in a local area among IV drug users, they quickly become the primary source of heterosexual and *in utero* transmission (89).

Differences in HIV seroprevalence by primary and other drugs used are mediated through these risk behaviors. For example, the pharmacological properties of cocaine (strong reinforcer, short duration of action) lead to more frequent use and binges. These patterns in turn are associated with increased HIV risk behaviors (3,372). Data from 1,878 active IV users of cocaine not in treatment in Chicago found that cocaine injectors used shooting galleries and shared drug paraphernalia more frequently than non-cocaine injectors (372). Recent studies from New York City found that crack use and crack-related sexual behavior were associated with HIV infection (48,255)

A recent study examined differences between seropositive and seronegative clients in a 1988 cohort of 222 admissions to methadone clinics in New York City (222). The results support previous findings that HIV infection is strongly associated with needle-sharing behaviors and the use of heroin and cocaine together ("speedballing"). A similar analysis of 218 subjects admitted in 1987 revealed that IV cocaine users were significantly more likely to be HIV positive than those who smoke or snort cocaine (221).

A seroprevalence study of IV drug users admitted to methadone clinics in 8 cities between 1987 and 1988 revealed that 71.3 percent reported using "speedball" during the past 5 years (24). These users were more likely to be seropositive, more involved with drugs, and engaged in high-risk drug-using and sexual behavior.

The potential for rapid spread of HIV infection among IV drug users should be emphasized (94). Explosive increases of HIV infection among IV drug users in Bangkok have been reported, with increases in HIV prevalence from 1 percent in late 1987 to 44 percent in September 1988. Sharing of injection equipment was identified as the primary risk factor (237,353). The investigators of a recent study that examined trends in HIV infection and AIDS risk behaviors among IV drug users in selected U.S. cities stated that although New York City and Ashbury Park already have high HIV-positive rates, Baltimore, Chicago, and Trenton, "may be approaching a 'critical mass' of infection which could result in rapid escalation" (29).

Seroconversion rates among IV drug users range from 3 to 10 percent or more per year and vary among different groups and cities (145). Analysis of data from 616 seronegative IV drug users not

enrolled in treatment in Chicago showed a 23-percent probability of seroconversion 25 months after entry into the study. This rate is almost tenfold higher than the rate reported in a cohort of gay men in Chicago during a similar time period (371).

HIV transmission has declined in homosexual men because of behavior changes since 1984, in hemophilic men because of heat treatment of clotting factors, and in transfusion recipients because of screening of blood collected since March 1985 (73, 253,360). A major route of HIV transmission now appears to be through exchange or sharing of needles used for IV drugs. Rates of seroconversion among drug users have remained high in recent years, and at least in some cities have not abated (145,371). Through May 1990, about 31 percent of AIDS cases were directly or indirectly associated with IV drug use (349). Thus, sharing injection equipment directly or indirectly has been a major vehicle for HIV transmission in the United States (349).

Estimates of IV Drug Abuse

Rates and trends in the use of needles as a route of drug administration are particularly important given the link to HIV spread. The accuracy of such estimates is not clear, because the estimates are based largely on guesses (282). The estimates depend on, among other variables, the definition of IV drug users and how seroprevalence rates are estimated.

According to estimates provided by State alcohol and drug abuse agencies to the National Association of State Alcohol and Drug Abuse Directors as a part of the 1988 State Alcohol and Drug Abuse Profile (SADAP),[4] the number of IV drug abusers across the country was reported to be greater than 1.3 million in 1988 (see ch. 3 for a description of SADAP and results) (45). The Research Triangle Institute, after reviewing existing studies and methods for the estimation of the number of IV drug users, suggested a total current estimate of approximately 1.8 million (64).

Results from the 1988 household survey show that approximately 2.5 million people aged 12 and older (1.3 percent of the population) have used needles as a method of drug administration sometime during their lifetimes (330). About 500,000 (0.3 percent of the population) used needles during the year prior to the survey, with needle use most prevalent among males, 18- to 34- year olds, and blacks. Approximately 1.9 million (8 percent of lifetime cocaine users) have used cocaine intravenously at some time in their lives, and 2 percent have done so during the past year (326).

According to the DAWN network, injection was the route of administration in about 80 percent of heroin ER mentions and 25 percent of cocaine mentions in 1988 (fig. 2-11). It should also be noted that the closeness of such estimates should not be regarded as persuasive, because they cannot be regarded as independent estimates (i.e., different guesstimates are based on some of the same indicators or correlates of IV drug user prevalence)(282).

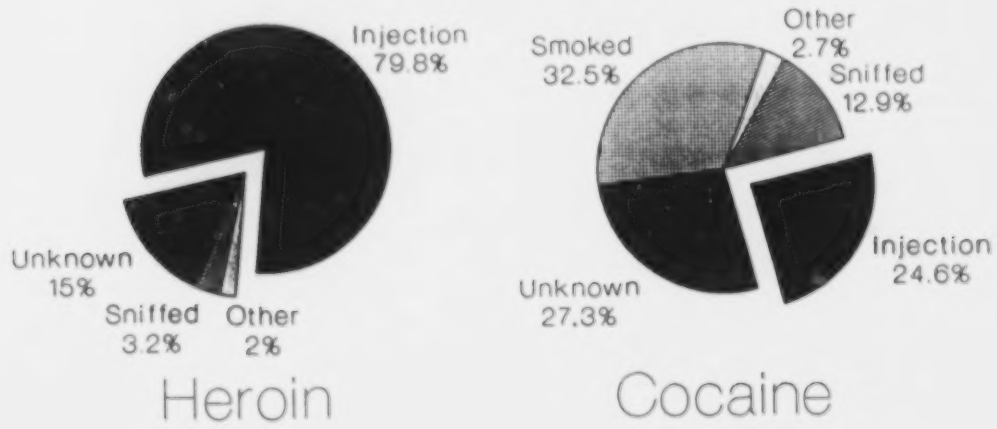
Estimates of Risk Behaviors Among Drug Abusers

Data available from the National AIDS Demonstration Outreach Research Project, the largest outreach program for IV drug users not in treatment, document the extent of IV drug-specific use (340). Of the 16,998 IV drug users studied between 1987 and 1989, 98 percent had injected heroin or cocaine, either mixed or sequentially. Only 2 percent reported injecting amphetamines or other drugs. Of all IV drug users who reported injecting heroin or cocaine, heroin was the predominant drug for 34 percent, cocaine for 31 percent, and heroin-cocaine combinations for 33 percent. More than half (59 percent) reported daily drug injection. Heroin was the predominant drug for those who reported drug use on a daily basis (38).

Preliminary results about risk behaviors of drug abusers not in treatment come from 10 cities involved in NIDA's National AIDS Outreach Demonstration Research Project in 1989. An initial assessment was conducted of 3,724 IV drug users not in treatment to measure behaviors that place the population at risk for AIDS (325). Only 16 percent of the men and 15 percent of the women reported

[4] Thirty-six States, the District of Columbia, and Guam provided estimates of the number of IV drug abusers (45).

Figure 2-11--Emergency Room Mentions of Cocaine and Heroin by Route of Administration, 1988



SOURCE: U.S. DHHS, NIDA (330).

that they did not share needles. Seventy percent and 63 percent, respectively, said that they had shared needles with 2 or more IV drug users during the previous 6 months. Similarly, a substantial majority of both males and females (77 and 72 percent, respectively) reported use of rented or borrowed needles, and 69 percent of males and 34 percent of females did not use new or bleach-cleaned needles. Based on a composite index of the 3,611 IV drug users who reported all of the above three risk behaviors (sharing needles, using rented or borrowed needles, and not using bleached cleaned needles), 75 percent of males and 69 percent of females were classified as being at high risk for HIV infection (325). More recent data from the same project, which includes 16,998 IV drug users, showed that 78 percent reported sharing drug-injection equipment and 20 percent reported sharing with strangers (340).

Another study of needle-sharing practices among IV drug users seeking treatment in 5 cities revealed an overall prevalence of needle-sharing at least once in the past 30 days of 64 percent, with a range of 45 to 95 percent (254).

Similar patterns are reflected in the data from the Drug Use Forecasting program of the National Institute of Justice. Among male arrestees from 14 cities in the first 3 months of 1989, 81 percent of those who tested positive for opiates also tested positive for cocaine (336). Drug injection at some point during their lives was reported by 15 to 38 percent of male arrestees (table 2-2). In 10 of the 14 cities, cocaine was more frequently reported to be injected than heroin. In 11 cities, more than 20 percent of injectors reported sharing needles (336).

A self-administered anonymous questionnaire was used by departments of education in 30 States, 10 cities, and two territories from February through May 1989 to assess HIV-related knowledge and behaviors among high school students (343).[5] Most students knew that AIDS or HIV infection can be transmitted by sharing needles used to inject drugs (93 to 100 percent). Rates of reported IV-drug use varied: between 2 to 5 percent of students reported ever injecting cocaine, heroin, or other illegal drugs, and 0.2 percent to 3 percent reported sharing needles to inject drugs. Despite survey limitations (e.g., a range of sampling schemes and response rates,

[5]School response rates ranged from 27 to 100 percent; student response rates ranged from 41 to 92 percent; and sample sizes ranged from 303 to 10,279 students (343).

Table 2-2--Percent Self-Reported Drug Injection and Needle-Sharing in Male Arrestees, Selected U.S. Cities, January to March 1989

City	Percent ever injected	Percent injectors who ever injected:			Percent injectors who currently share needles
		Cocaine	Heroin	Amphetamines	
Cleveland	17	74	71	15	15
Dallas	15	67	46	51	36
Detroit	19	60	95	5	10
District of Columbia	19	78	78	5	22
Indianapolis	17	81	44	46	26
Kansas City	18	66	39	61	16
New Orleans	18	80	69	5	33
New York	21	91	89	19	30
Philadelphia	19	83	64	44	24
Phoenix	25	89	57	43	20
Portland	30	71	64	70	29
San Antonio	24	68	76	36	48
San Diego	38	57	70	49	34
St. Louis	18	91	64	40	24

SOURCE: U.S. DHHS, CDC (336).

limited sample sizes, and the problem of reliability of self-reports and missed populations (those not in school), these data indicate that many students are at risk for HIV infection because they use IV drugs.

Data from the National AIDS Outreach Demonstration Research Project documented the extent of sexual practices that relate to HIV spread. Between 1987 and 1989, 29 percent of male and 34 percent of female IV drug users not in treatment reported two or more IV drug-using sexual partners. Furthermore, 59 percent of male and 48 percent of female IV drug users said that they had engaged in sexual activity exclusively with non-IV drug users. With respect to condom use, only 11 percent of men and 17 percent of women indicated that they always used condoms (325). Overall, the analysis showed a correlation between high-risk sexual behavior and high-risk drug use behavior.

HIV Seroprevalence Among Drug Users

Unlike AIDS cases, which are reported to the CDC, there is no comprehensive system for monitoring the prevalence of HIV infection. According to the various assumptions used in the calculation, the estimate of HIV-infected IV drug users varies from 61,000 to 398,000 (126). The prevalence of HIV infection among IV drug users in treatment varies widely by geographic area, with the highest rates observed in the Northeast (10 to 65 percent) and the lowest in areas of the West, Midwest and South (some areas less than 5 percent) (126). An ongoing survey of clients entering treatment in 41 clinics in 21 metropolitan areas and an examination of 7,000 sera revealed a range of seroprevalence rates among IV drug users of 0 to 48 percent, with a median rate for all clinics of 2.9 percent (4). IV drug users in clinics in New York City and Newark, however, typically had rates over 40 percent. Rates as high as 50 to 60 percent have been reported from addicts in treatment in these areas (89).

A separate study of seroprevalence in IV drug users entering treatment between 1988 and 1989 examined the association between HIV-positive status and the primary drug of abuse. It showed that although heroin was associated with the highest median HIV-positive rates (4 percent), it was followed closely by cocaine, with 3.1 percent (4).

Of the 1.8 million IV drug users estimated by the Research Triangle Institute in 1989, 902,000 were estimated to use IV drugs occasionally and an additional 893,000 individuals were estimated to use needles frequently enough to place them at risk for HIV infection (64).

AIDS Cases Reported to the Centers for Disease Control

The Centers for Disease Control (CDC) estimates that there are currently about 1 million persons in the United States who are infected with HIV (338). When reviewing statistics on AIDS reports, one should note that AIDS diagnosis typically lags 5 or more years behind actual infection with HIV and may not reflect the most up-to-date information on current ways the virus is spreading.

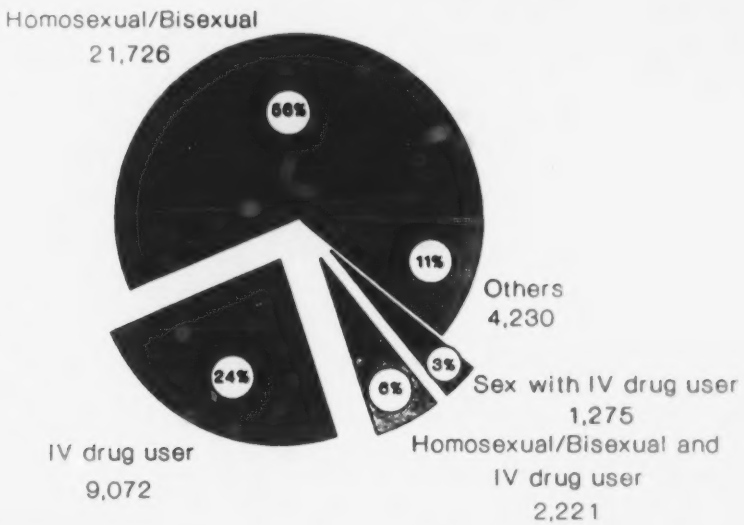
From diagnosis of the first AIDS case in 1981 through May 1990, 136,204 AIDS cases were reported to the CDC, including 2,315 pediatric cases (4).[6] There have been 83,145 AIDS-related deaths reported through May 1990, including 1,239 pediatric fatalities. Rates of reported AIDS cases were highest for blacks and Hispanics; for persons 30 to 39 years of age; in the Northeast region and in U.S. territories (primarily reflecting rates in Puerto Rico); in the largest metropolitan areas; and for men. Rates vary tremendously among and within States.

[6]For the purpose of the CDC's AIDS case definition, pediatric cases are those occurring in children under the age of 13 (349).

IV Drug Use as an AIDS Risk Factor

IV drug use is the second most common risk behavior among cases of AIDS in the United States, surpassed only by men having sex with other men. In 1988 and 1989, one-third of all reported AIDS cases were associated with IV drug use (4). Between June 1989 and May 1990, health departments of the 50 States, the District of Columbia, and U.S. territories reported 12,985 cases of AIDS in IV drug users, their sexual partners, and babies born to mothers who were IV drug users or sexual partners of IV drug users. IV drug use was a risk factor in 33 percent of the 39,203 AIDS cases reported during that 12-month period. Among the 38,524 adult and adolescent AIDS cases reported from June 1989 to May 1990, 9,072 (24 percent) were female or heterosexual male IV drug users, 2,221 (6 percent) were male homosexual/bisexual IV drug users, and 1,275 (3 percent) were attributed to heterosexual contact with an HIV-infected, IV drug-using partner (see fig. 2-12). Furthermore, of the 590 pediatric

Figure 2-12--AIDS Cases in Adults and Adolescents by Risk Factor, June 1989 through May 1990



SOURCE: U.S. DHHS, CDC (349).

AIDS cases presumably associated with perinatal transmission, 70 percent (417 cases) had mothers who were IV drug users or sexual partners of IV drug users (349).

The same pattern pertains to cumulative U.S. AIDS cases reported to the CDC. Through May 1990, 27 percent of AIDS cases among adult men and 71 percent of AIDS cases among adult women were directly or indirectly associated with IV drug use (349). In addition, 71 percent of children who were presumably infected through perinatal transmission had mothers who were IV drug users or sexual partners of IV drug-users (349).

Trends in AIDS Cases

IV drug use has been associated with a growing percentage of AIDS cases. During the 3-year period between December 1986 and December 1989, the percentage of AIDS cases reported in female or heterosexual male IV drug users increased from 17 percent to 23 percent (344,345). The increasing proportion of IV drug use in total AIDS cases from 1986 through 1989 has to some extent been mediated by the 1987 change in the CDC's AIDS case definition (see below). The increase in AIDS cases associated with IV drug use parallels an increase in cases attributed to heterosexual contact with IV drug users and an increase in AIDS cases in children of women who were IV drug users or sex partners of IV drug users (338).

Geographic Concentrations of AIDS Cases

In 1988, 4.3 cases of IV drug use-associated AIDS per 100,000 population were reported to the CDC (335). Rates of IV drug use-associated AIDS varied widely by area; rates in Puerto Rico, New Jersey, New York, and the District of Columbia were >10 cases per 100,000 population (fig. 2-13). Rates were highest in the Northeast region, where there were almost 12 cases per 100,000 population (table 2-3). Although the Northeast represents 19.7 percent of the population of the United States and its territories, 54.5 percent of IV drug use-associated cases of AIDS were reported there (335). Reported AIDS cases associated with IV drug use were concentrated in a few large metropolitan areas; however, there is recent evidence of increasing AIDS cases in small metropolitan and rural areas (3). In several Northeastern States and Puerto Rico, the number of AIDS cases in IV drug users exceed those in homosexual men (335).

Prevalence of AIDS Among Blacks and Hispanics

The original AIDS case definition was standardized on gay men, and until the case definition was revised in 1987, AIDS surveillance probably resulted in a large underestimation of AIDS in IV drug users, blacks, and Hispanics by failing to attribute death among these groups to AIDS (286). In spite of possible underestimation, selected racial

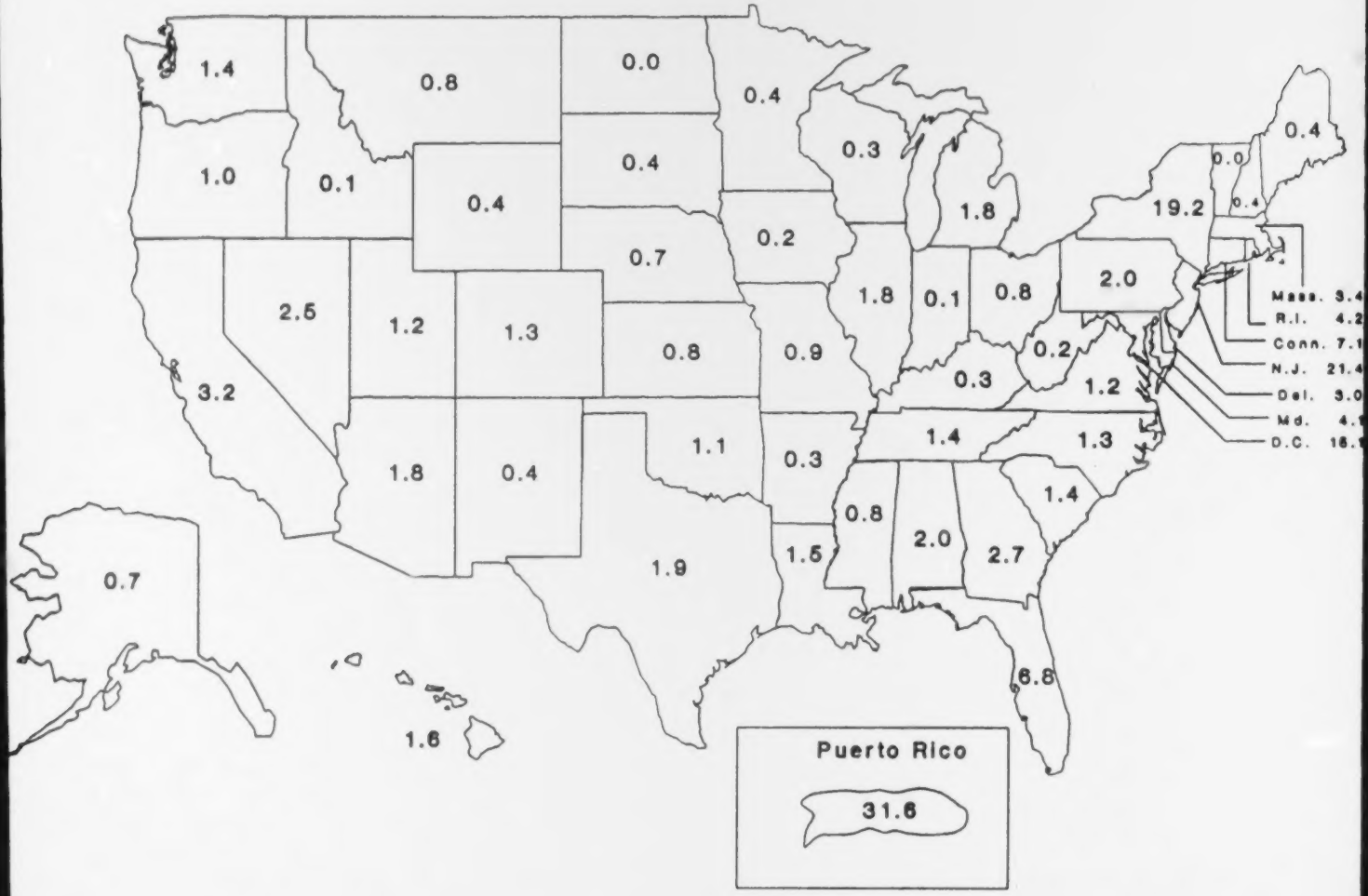
Table 2-3--Number and Rate Per 100,000 Population of AIDS Cases Associated With IV-Drug Use, by Census Region and Race/Ethnicity, 1988

Race/ethnicity	Number of cases (rate)				
	Northeast	Midwest	South	West	Total[a]
White[b]	1,203 (2.9)	217 (0.4)	687 (1.2)	719 (2.2)	2,826 (1.6)
Black[b]	2,929 (62.0)	294 (5.5)	1,318 (9.5)	277 (12.5)	4,818 (18.4)
Hispanic	1,699 (65.2)	69 (5.4)	135 (3.0)	159 (2.5)	2,062 (14.1)
Asian/Pacific Islander	6 (1.1)	0 (0.0)	0 (0.0)	6 (0.3)	12 (0.3)
American Indian/ Alaskan Native	1 (1.2)	2 (0.8)	0 (0.0)	6 (0.8)	9 (0.6)
Unspecified	23	0	0	2	25
Total	5,861 (11.9)	582 (1.0)	2,140 (2.8)	1,169 (2.7)	9,752 (4.3)

[a]Total cases and total rates exclude territories. Rates are based on the U.S. census.
[b]Non-Hispanic.

SOURCE: U.S. DHHS, CDC (335).

Figure 2-13--Reported AIDS Cases Associated With IV Drug Use per 100,000 Population United States, 1988



SOURCE: U.S. DHHS, DC (335).

and ethnic minorities are over-represented in AIDS case reports compared with the general population. As table 2-3 indicates, the rate of IV drug use-associated AIDS is higher for blacks and Hispanics than for whites.[7] Blacks make up 12.2 percent of the U.S. population, but account for 27.8 percent of total AIDS cases and 45.2 percent of AIDS cases where IV drug use has been listed as a risk factor (349). Hispanics make up 8.1 percent of the U.S. population, but account for 15.7 percent of total AIDS cases and 25.9 percent of cases where IV drug use has been listed as a risk factor (349). The proportion of AIDS cases among minorities is even more dramatic for pediatric AIDS cases. Over half of pediatric AIDS cases reported through May 1990 (51.7 percent) were blacks, 25.5 percent were Hispanics, and 21.9 percent were whites (349).

Effect of the 1987 Revision of CDC's AIDS Case Definition

CDC's 1987 revision of the AIDS case definition appears to have increased the number of AIDS cases reported in IV drug users, blacks and Hispanics, and persons living in the Northeast (337). Previously, these groups and areas were thought to be greatly underestimated by the AIDS surveillance, because deaths among IV drug users with AIDS did not meet the earlier case definition. In August 1987, the CDC surveillance case definition for AIDS was expanded to include additional AIDS-indicator diseases (e.g., HIV dementia, wasting syndrome, extrapulmonary tuberculosis) and to accept some other indicator diseases as presumptive diagnoses of AIDS (e.g., Pneumocyctis carinii pneumonia, Kaposi's sarcoma, esophageal candidiasis) when tests for HIV are positive (334).

Of the IV drug-use-associated AIDS cases reported in 1988, 4,682 (43.6 percent) met the case definition solely on the basis of criteria added by the 1987 case definition revision (335). The proportion of IV drug-use-associated AIDS cases has been higher in the Northeast than in other regions. Since the beginning of 1988, the number of AIDS cases associated with IV drug use has equalled or exceeded all other cases reported in the Northeast. The new criteria captured persons who eventually would progress to meet the previous definition and those who never would have met the previous definition. The latter has been noted to be particularly important in IV drug users, who may use health care services for HIV-related illness later and may die of HIV-related opportunistic infections before they are diagnosed as having AIDS.

[7] A future Staff Paper in the Office of Technology Assessment's AIDS series plans to analyze HIV rates among blacks and Hispanics.

Table 2-4–Projected Number of AIDS Cases, Persons Living With AIDS, and Deaths Attributable to AIDS After Adjustment for Underreporting, 1989 to 1993[a]

Year	AIDS cases		
	New cases[b]	Alive[c]	Deaths
1989	44,000 - 50,000	92,000 - 98,000	31,000 - 34,000
1990	52,000 - 57,000	101,000 - 122,000	37,000 - 42,000
1991	56,000 - 71,000	127,000 - 153,000	43,000 - 52,000
1992	58,000 - 85,000	139,000 - 188,000	49,000 - 64,000
1993	61,000 - 98,000	151,000 - 225,000	53,000 - 76,000
Through 1993[d]	390,000 - 480,000		285,000 - 340,000

[a] Projections are adjusted for unreported diagnoses of AIDS by adding 18 percent to projections obtained from reported cases (corresponding to 85 percent of all diagnosed cases being reported: 1/0.85 = 1.18) and rounded to the nearest 1,000.
[b] Number of cases diagnosed during the year.
[c] Persons with AIDS alive during the year.
[d] Rounded to the nearest 5,000. Includes an estimated 120,000 AIDS cases diagnosed through 1988, 48,000 persons alive with AIDS at the end of 1988, and 72,000 deaths in diagnosed patients through 1988.

SOURCE: U.S. DHHS, CDC (338).

Projected AIDS Cases

Following a meeting in Atlanta in the fall of 1989, Federal scientists revised their estimates of the number of new U.S. AIDS cases in the next 3 years. Although the number of new cases is still expected to rise sharply, the total number is expected to be 10 to 15 percent fewer than previously expected (338). The following explanations have been suggested to have contributed to the decline:

- preliminary estimates made in 1986 by the Public Health Service were too high because data used to make the predictions were imprecise. The CDC revised estimates of Americans infected with HIV in 1986 from between 1 million and 1.5 million to about 750,000;
- the use of drugs, such as zidovudine, has delayed the onset of AIDS symptoms that would qualify individuals for the AIDS-case definition;
- changes in behavior to reduce the spread of AIDS, particularly among male homosexuals, have decreased the spread of the disease beyond what was expected; and
- the epidemic has slowed because the most susceptible have already been infected (338).

CDC estimates that between 1989 and 1993 there will be somewhere between 390,000 and 480,000 new AIDS cases (338). Deaths attributable to AIDS are expected to be between 285,000 and 340,000 during that period (see table 2-4 for yearly breakdowns). Table 2-5 contains the projected number of AIDS cases by risk-behavior group from 1989 through 1993.

Cost Estimates of Drug Abuse

Although there is little disagreement that drug abuse in the United States has become a major public health problem, estimating the cost to society is a difficult task. Over the past 20 years, numerous studies have assessed the economic costs of drug abuse and other illnesses (e.g., alcohol abuse and mental illness). These studies differed in their content, theoretical approach, and relevance to policy decisions, and worked around data limitations and the necessary assumptions involved in estimating intangible costs (108).

According to French and his co-investigators, past studies of the cost of the drug abuse problem have significantly underestimated the true cost to society by failing to estimate certain tangible costs (e.g., reduced property value in high drug use communities; the real and opportunity cost of educational programs to reduce the consequences of drug abuse; and the costs of complications related to secondary diseases, such as AIDS) (108). Because of the difficulty and controversy associated with developing methods to estimate intangible costs to the individual drug user and society (e.g., depression, extended isolation, physical disability, and other forms of pain and suffering), these have rarely been included in cost estimates. More specific costs of drug-related treatment, better information on worker absenteeism, and drug-related budgets for local, State, and Federal criminal enforcement, however, have helped to make recent analyses more accurate (188).

Table 2-5--Projected Number of AIDS Cases by Risk Group, 1989 to 1993[a]

	Homosexual/bisexual men				
Year	Not IV drug users	IV drug users	Heterosexual IV drug users	Heterosexual transmission	Pediatric
1989	26,000 - 28,000	2,600 - 2,800	11,000	2,700 - 2,900	1,000 - 1,100
1990	29,000 - 31,000	2,700 - 3,000	13,000 - 14,000	3,800 - 4,100	1,300 - 1,400
1991	30,000 - 38,000	2,600 - 3,300	14,000 - 18,000	5,000 - 6,400	1,500 - 2,000
1992	30,000 - 43,000	2,500 - 3,500	16,000 - 23,000	6,500 - 9,300	1,800 - 2,600
1993	30,000 - 48,000	2,400 - 3,500	17,000 - 27,000	8,100 - 13,000	2,000 - 3,200

[a]Predictions are adjusted for unreported cases.

SOURCE: U.S. DHHS, CDC (346).

The approach that most analysts have used to estimate costs of alcohol abuse, drug abuse, and mental illness is based on the cost-of-illness methodology that estimates the aggregate monetary burden to society of the health effects of illness. This methodology recognizes direct tangible costs, such as the value of resources needed to treat the disease, and indirect tangible costs, such as the value of output lost due to mortality and morbidity. Recently, researchers have used the cost-of-illness approach to measure consequences not related to health (e.g., the linkages between drug abuse and crime, motor vehicle accidents, and social welfare problems) (108).

French and his co-investigators have outlined a conceptual framework to help make the process of estimating the social costs of drug abuse more uniform and to capture some of the tangible and intangible costs that were previously not included (108). The first step of their framework calls for categorizing the adverse health and nonhealth consequences into one of three classes: physical health problems (e.g., death, brain damage, AIDS-related diseases); mental health problems (e.g., neurotic and emotional disorders); and social problems (crime, reduced job performance, family and community disruptions). The second step in their framework is the identification and classification of associated costs according to private tangible and intangible costs and external tangible and intangible costs. The final step to their approach requires selecting and developing methods to estimate each of the social cost elements. Here, French and his colleagues recommend combining and extending new and existing methods for a more comprehensive estimate of social cost.

In a contract report for the Alcohol, Drug Abuse, and Mental Health Administration, Harwood, et al., estimated the economic costs to society of drug abuse in 1983 to be close to $60 billion (136). A substantial part of the total cost (over $33 billion) was attributed to reduced productivity. The cost of crime attributed to drug abuse was another major contributing cost. The latest study on the cost of drug abuse by NIDA should be released in late summer 1990. (See app. F for findings from a cost-benefit analysis of drug abuse treatment.)

One of the rising costs associated with drug abuse is the treatment of addicted infants. Estimates of the number of babies exposed to illicit drugs vary. In a survey of 36 hospitals conducted in 1988 by the National Association for Perinatal Addiction Research and Education, 11 percent of pregnant women had exposed their fetuses to one or more illegal drugs, with cocaine or crack as the primary drug used (75 percent of cases)(301). Estimates of the number of infants born each year to mothers who use drugs range from 200,000 to 375,000 (41,104). The President's National Drug Control Strategy report estimates that 100,000 cocaine exposed babies are born each year (104). Some of the costs associated with fetal exposure to illicit drugs include medical treatment of fetal withdrawal symptoms, out-of-home care resulting from child abuse and neglect, and the treatment of special medical, educational, and psychological needs of drug-exposed babies.

SUMMARY

Certain behaviors associated with IV drug use are major vehicles of HIV transmission in the United States. IV drug use is the second most common risk behavior among AIDS cases and has been associated with a growing percentage of AIDS cases. Through May 1990, 27 percent of AIDS cases among adult men and 71 percent of cases among adult women were directly or indirectly associated with IV drug use (349). Moreover, 71 percent of children with AIDS who were presumably infected through perinatal transmission had mothers who were IV drug users or sexual partners of IV drug-users (349). In several Northeastern States and Puerto Rico, the number of AIDS cases among IV drug users exceed those in homosexual men. In examining current AIDS cases, one should also keep in mind that they reflect what occurred 5 to 7 years ago. According to the CDC, many of the current cases among IV drug users may reflect the HIV epidemic among a cohort of heroin users who started heroin use in the mid-1960s to mid-1970s (335). The impact of more recent trends of IV cocaine use, which is associated with more frequent injection and needle-sharing, and the impact of crack cocaine use and associated sexual activity with the potential for increased sexual HIV transmission are yet to come.

Although each of the major studies of drug use and consequences in the United States (the household survey, high school seniors survey, and DAWN) has recognized limitations, they do provide "a general overview of the problem, follow the evolution, and point out areas in which more knowledge is needed" (293). The Senate Judiciary Committee's recent attempt to develop a more complete estimate of the number of cocaine addicts included, in addition to the household survey estimate, estimates of cocaine addicts in drug treatment centers, the homeless population, and those who had come in contact with the criminal justice system via arrests (304).

As William Bennett remarked on the release of the 1988 National Household Survey on Drug Abuse, "There's some very good news, and some very bad news" concerning the state of the nation's drug problem (30). The good news is that recent surveys have found illegal casual use of most drugs to be on the decline. The bad news in this evolving story is that the number of cocaine addicts has increased in recent years, and the costs associated with drug treatment, productivity losses, and crime have risen dramatically.

The number of household members reporting current cocaine use dropped 50 percent, from 5.8 million in 1985 to 2.9 million in 1988 (330,331). Although the declining trends in casual cocaine use are indeed encouraging, new reason for concern centers on the increasing *frequency* of cocaine use among current users. Estimates of the number of addicts (people who use cocaine at least once a week) range from 862,000 to 2.2 million (304,330). ER mentions associated with cocaine use have risen sharply in recent years (increasing fourfold from 8,831 mentions in 1984 to 46,020 mentions in 1988)(329).

According to 1988 household survey data, 2 million people (about 1 percent of the population) have tried heroin at least once during their lifetimes (330). Heroin ER mentions increased much more slowly than cocaine mentions, and in 1985, cocaine surpassed heroin as the most frequently mentioned drug in ER episodes (329).

The estimated number of IV drug users in the United States ranges from 1.3 to 1.8 million (64,145). A major route of HIV transmission in this group is the sharing of injection equipment. Sharing of injection equipment, which occurs for practical, economic, and social reasons, is a common practice throughout the country in both low and high HIV seroprevalence ares. Various studies reported sharing rates ranging from 70 to 100 percent (8). DAWN statistics show that injection was the route of administration in about 80 percent of heroin ER mentions and 25 percent of cocaine mentions in 1988 (328). Prevalence and trends in IV drug abuse are not well documented, but of great importance given the connection with HIV spread. The potential for rapid escalation of HIV infection among IV drug users, as did occur in New York City, Thailand, and elsewhere, is always a possibility. Intense prevention efforts are necessary to control further spread of HIV among those not yet infected.

Chapter 3
Treatment for Drug Abuse in the United States

INTRODUCTION

This chapter describes the primary drug treatment modalities and examines information on treatment programs in the United States. The goals and characteristics of the major treatment modalities are distinguished, and the client characteristics currently associated with each are described.

Given what is known about the extent of the drug abuse and human immunodeficiency virus (HIV) epidemics (ch. 2), the next logical question is whether the drug treatment system in the United States has the capacity and flexibility to meet the demand for treatment. Data limitations on the capacity, need for, and cost of treatment services are an impediment to answering this question and to more accurate planning to increase the availability and accessibility of treatment services to drug abusers.

TREATMENT MODALITIES

Introduction

Treatment for drug abusers has traditionally been categorized into three major modalities: outpatient methadone maintenance, residential therapeutic communities (TCs), and outpatient drug-free (ODF) treatment. A common distinction among programs has been whether they use medicines to treat drug abuse (pharmacotherapy) or are "drug-free." Methadone maintenance treatment, which uses daily doses of the synthetic narcotic methadone, is the dominant pharmacotherapy for the treatment of opiate abusers. Within the drug-free category, residential TCs, which are distinguished by their highly demanding and confrontational approach, and ODF treatment, which includes a very heterogeneous group of programs, have been the most popular treatment modalities. Both TCs and ODF programs treat all types of drug abusers, not just narcotics abusers.

Although these three modalities are still the most prevalent forms of drug abuse treatment (45), changes are beginning to occur in the drug abuse treatment system in response to a changing client population (e.g., the increased prevalence of cocaine abusers). The spread of HIV has also added pressure to the need for innovative psychological and pharmacological approaches for intravenous abuse of opiates and stimulants (178). Innovative approaches are being tried in an attempt to meet diverse client needs. For example, methadone maintenance programs and TCs have rarely collaborated in the past. In a research project in San Francisco from 1981 to 1984, however, an attempt was made to help clients on methadone detoxify to a drug-free life while residing in a TC (279). Two treatment approaches that have become popular are 28-day residential hospital programs and Narcotics Anonymous, self-help support groups patterned after Alcoholics Anonymous (AA). A variety of ODF treatments that provide intermediate levels of care (including day care, evening care, and halfway houses[1]) have also become more common (203). New pharmacotherapies are being studied and tested for their effectiveness in treating cocaine and polydrug abusers in addition to heroin addicts. In a few areas of the country, a multi-modality treatment approach has been tried in which the area's various treatment programs operate under a central referral center.

The need for a range of treatment options stems from the diversity that exists among drug abusers. Abusers differ, among other variables, in the drugs they use, the presence or absence of psychiatric disorders, educational and occupational achievements, and family and social support systems (319). Although many drug abusers require multiple treatment episodes to combat the chronic relapsing nature of drug abuse, other drug abusers may require a single treatment episode of relatively short duration (154). Different treatment approaches might also be appropriate at different points in the individual's addiction career.

[1]Day care is treatment for drug abusers who spend the day in treatment and return home in the evening; evening care is for those who work during the day and spend a few hours in treatment at night; and halfway houses are for people who reside in the treatment house and go out to work during the day (203).

In general, drug treatment centers serve a predominantly young adult, poorly educated, male clientele; however, State drug agency directors and treatment program administers report that today's clients are more likely to use multiple drugs and to be female than they were a decade before (149). Although each of the modalities treats a variety of patients, some client characteristics are disproportionately represented in specific modalities. Because of the pronounced differences in treatment approaches and client populations, this chapter and the following chapters on treatment effectiveness consider each modality separately.

Role of Detoxification

Detoxification is often the first stage in the treatment process. The primary goal of detoxification is to stabilize the drug abuser while a drug-free state is being reached. Detoxification programs use licit drugs (e.g., methadone or clonidine) on a short-term basis to help manage withdrawal symptoms while the abused drug is being eliminated and the body adjusts to its absence (13). Although some people view detoxification as a modality in and of itself, others see the value of detoxification as a "gateway" to more intensive treatment interventions (13). For example, detoxification must be completed before entry into TCs, ODF programs, and certain pharmacotherapies (170). To date, detoxification using substitute medications is only truly available for opiates, sedative-hypnotics, and alcohol. Although short-term residential programs frequently say they offer cocaine detoxification, technically they do not use pharmacologic agents to achieve detoxification (35).

The ideal detoxification agent would be completely effective in relieving symptoms of withdrawal, orally active, long-acting, safe, and of low addiction potential (178). Since no single agent meets all of these characteristics, a search continues for new pharmacologic agents to treat drug abuse.

Because methadone is a narcotic, it is a controlled substance in the United States. Any organization dispensing methadone, whether for detoxification or maintenance treatment and regardless of whether the program accepts public funding, must abide by mandatory regulations concerning minimum standards for admission, urine testing frequency, patient evaluation guidelines, and provided services (counseling, vocational, rehabilitative, and other support services) (54 FR 8954). It should be noted that these Federal regulations cover the use of all narcotics; thus detox-ification or maintenance with Levo-Alpha-Acetyl-Methadol (LAAM), burprenorphine, or any other narcotic would also be covered. The Narcotic Addict Treatment Act of 1974 (Public Law 93-281), which requires the registration of practitioners conducting methadone treatment programs, defined detoxification treatment as:

> the dispensing, for a period not in excess of 21 days, of a narcotic drug in decreasing doses to an individual in order to alleviate adverse physiological or psychological effects incident to withdrawal from the continuous or sustained use of a narcotic drug and as a method of bringing the individual to a narcotic drug-free state within such a period.

In March 1989, the Food and Drug Administration (FDA) and the National Institute on Drug Abuse (NIDA) issued a final rule on conditions of methadone use, in which the length of detoxification treatment was expanded to include short-term detoxification treatment (not in excess of 30 days) and long-term detoxification treatment (between 30-180 days) (54 FR 8960).

Although methadone is still widely used, clonidine has become a standard method of opiate detoxification in many places (179). Because clonidine is not a narcotic or a controlled substance, it can be used by a wider range of physicians and in treatment settings that are not licensed to dispense narcotics (171). One advantage that clonidine has over methadone is that it shortens the period of time necessary for withdrawal (from 20 to 30 days to 10 to 14 days) (171).

Clonidine is also being studied in combination with naltrexone as a nonopiate detoxification method. This approach has an advantage over other

detoxification methods in that complete detoxification can be achieved in just 3 to 4 days instead of 21 days with methadone or 14 days with clonidine alone (178).

Because opiate detoxification has been a short-term therapeutic approach, the provision of support services has not usually been stressed to the extent that it is in some of the longer-duration treatment modalities. It is hoped that recently available long-term detoxification will provide the flexibility for programs to aid those drug abusers who require more extensive treatment (35).

Detoxification may take place in outpatient settings or in hospital inpatient or other residential programs. The Office of National Drug Control Policy has stated that most patients can be detoxified in less expensive outpatient programs, but offered no supporting evidence (105).

A controversial issue associated with detoxification has been how the programs are used by clients. It has been reported that certain opiate addicts entering detoxification are unwilling to make a commitment to give up their addiction and merely seek a break in the stressful life of hustling for drugs or a reduction in their tolerance so that they can achieve euphoria with smaller quantities of narcotics (223). Detoxification treatment, however, offers the opportunity to counsel these clients about the risks of drug abuse (including HIV infection), orient them to long-term modalities, and facilitate referrals whenever they seem appropriate.

Pharmacotherapy Treatment Approaches

Medication to treat drug abuse was first used in the mid-1960s with heroin abusers. Methadone and naltrexone, both of which are used to treat narcotic abuse, are the only two drugs currently approved by FDA for drug abuse treatment. In response to the continuing drug crisis, NIDA's Drug Development Task Force has explored further research and development of pharmacotherapies that:

- block the effects of abused drugs,
- reduce the craving for abused drugs,
- moderate or eliminate withdrawal symptoms,
- block or reverse toxic effects, and
- prevent, under certain conditions, initial drug abuse (320).

Although more research is needed, some progress has been made in recent years in understanding how drugs act on the brain to create a "reward system," in which the experience of pleasure caused by the drug reinforces drug use (303). Understanding how drugs initiate chemical reactions in the brain that cause compulsive drug-seeking behavior is thought to hold the key for the development of treatments that can interfere with those processes and stop the addictive cycle (320). NIDA is currently overseeing the research and development of 28 pharmacotherapeutics (see table 3-1).

Pharmacotherapies are commonly viewed as an adjunct to more traditional psychosocial treatment methods. One way that pharmacotherapies may support other treatment methods is that, by reducing abusers' intense craving for drugs, they may make patients more receptive to psychological counseling and other rehabilitative services (303).

Pharmacotheraphy for Narcotics Abuse

Through advances made in the mid-1970s, drug abuse researchers have observed that exogenously-administered opiates, such as heroin, may lead to addiction through actions on endogenous opiate peptide and receptor systems of the brain (333). These discoveries have guided the use of two general types of narcotic pharmacotherapies: narcotic agonists, which have narcotic effects, and narcotic antagonists, which block the effects of narcotics. By binding to the same receptors as illicit narcotics, narcotic agonists replace the addict's physiological requirement for narcotics (e.g., heroin), thereby preventing the onslaught of a painful withdrawal syndrome. They also reduce narcotic hunger or craving and, as tolerance increases, offer a blockade to injected heroin (35). Narcotic antagonists, on the other hand, block the euphoria caused by narcotics by preventing the access of these drugs to opiate receptor sites, but have no intrinsic effect of their own.

Methadone Maintenance--Methadone is a long-acting narcotic agonist that was first studied for its effectiveness in treating long-term opiate abuse in the mid-1960s (100). Of all the treatment modalities, methadone maintenance has been subjected to the most extensive research and evaluation.

Table 3-1—Drug Development Program of the National Institute on Drug Abuse (NIDA), 1988

Drug	Therapeutic indication	Status of FDA process	Original owner of patent
Opiate treatment agents			
Methadone and naxolone	Opiate maintenance therapy Lower abuse potential	Approved but not marketed	Bristol
Depot Naltrexone	Long-term opiate blockade	Standard drug approved	Dupont
LAAM	Opiate maintenance therapy	Phase III completed	Public
Chlonidine	Opiate detoxification	Currently in use in open trials	Boehringer
Buprenorphine	Opiate detoxification Opiate maintenance & blockade	Phase II	Norwich Eaton
Metkephamid	Opiate maintenance therapy	Phase I	Lilly
Acetorphan	Opiate maintenance therapy	Animal testing	
Cocaine treatment agents			
Desipramine	Treat withdrawal	Phase II	Merrell Dow
Imipramine	Treat withdrawal	Phase II	Geigy
Carbamazepine	Treat withdrawal	Phase I	Geigy
Mazindol	Treat withdrawal	Phase I	Sandoz
Flupenthixol	Treat withdrawal	Clinical evaluation	Merrell Dow
Fluoxetine	Treat cocaine & PCP withdrawal	Clinical evaluation	Dista/Lilly
Nifedipine	Block euphoria	Phase II	Pfizer
Buprenorphine	Block euphoria	Clinical evaluation	Norwich Eaton
Verapamil	Block euphoria	Animal Testing	Searle
Diltiazem	Block euphoria	Animal Testing	Marion
Sulpiride	Block euphoria	Animal Testing	Delegrange
SCH23390	Block euphoria	Animal Testing	Schering
L-tryptophan	Functional antagonism	Phase II	Public
Amantadine	Maintenance therapy	Phase I	Endo
Bromocriptine	Maintenance therapy	Phase I	Sandoz
Methyiphenidate	Maintenance therapy	Phase I	CIBA
L-DOPA	Replacement therapy	Clinical evaluation	Roche

ABBREVIATION: FDA = Food and Drug Administration.

[a]Administration of Naltrexone in a depo form, i.e., skin implants that gradually release the drug into the bloodstream.

SOURCE: US DHHS, NIDA (320).

Methadone has proven to be a good maintenance agent. It can be administered regularly (usually once a day) by oral administration as a substitute for the illicit narcotics. Although the effect of a single heroin injection usually lasts 4 to 6 hours, methadone remains active for more than 24 hours. As an agonist, methadone produces a cross tolerance with narcotics to reduce withdrawal symptoms and block the effects of heroin. Because methadone produces minimal euphoria when taken orally, patients can continue to work or go to school (170).

As mentioned in the discussion of detoxification programs, because methadone is a narcotic, Federal regulations govern its administration. Conditions for the use of methadone in maintenance treatment (21 CFR Part 291) require that clients entering methadone maintenance programs prove that they are currently narcotic dependent (i.e., that they physiologically need heroin or a morphine-like drug to prevent the onset of signs of withdrawal) and that they became dependent at least 1 year before admission to maintenance treatment (54 FR 8960-8964).

Federal regulations include requirements for client treatment plans, mandatory counseling sessions, and routine urine testing. Federal regulations also require that methadone maintenance clinics provide "a comprehensive range of medical and rehabilitative services" to those in need of such services who receive methadone treatment (54 FR 8966). Despite these regulations, however, methadone maintenance clinics vary extensively in the selection and emphasis on the support services they provide (e.g., counseling, vocational and educational training) and in their program structure (e.g., dosage levels, frequency of urine tests, take-home policies).

Methadone maintenance programs also differ in the extent to which detoxification from methadone is the ultimate treatment goal. Although Federal regulations state that an eventual drug-free state is a realistic goal for many people, they also recognize that some patients may need to stay on methadone for long periods (45 FR 62717). There are two general types of methadone treatment programs. In long-term methadone maintenance, clients are expected to continue on methadone indefinitely. A different approach is taken by methadone-to-abstinence programs, where the goal is eventual drug-free living. Although long-term maintenance programs typically prescribe high doses of methadone to block the effects should a client attempt to use heroin, methadone-to-abstinence programs typically prescribe as low a level as the patient can take to prevent withdrawal (149). Average time in treatment varies among programs and patients even within these two approaches.

Individual State regulations also govern the use of methadone. A NIDA survey of State methadone treatment programs found that several States did not provide methadone treatment programs and that a large majority of those that did had some type of regulation of methadone programs, including allowable dosage levels and mandatory inspections (213). Of the authorities that responded from 39 States, the District of Columbia, Puerto Rico, and the Virgin Islands, 6 States (Arkansas, Maine, Montana,[2] North Dakota, South Dakota, and Wyoming) had no methadone treatment programs. At least 2 of the 11 States that did not respond (Mississippi and New Hampshire) also do not provide methadone treatment programs. Three States (Oklahoma, Vermont, and West Virginia) had methadone detoxification programs but not maintenance programs.

Although the substitution of methadone, a licit opiate, for illicit opiates, such as heroin, is the most common technique for the treatment of narcotic addicts, it remains a controversial issue (see ch. 4). Methadone itself is a dependence-producing drug, and patients experience withdrawal symptoms when they stop methadone treatment. There is a common *misconception* that methadone provides euphoria which in turn spurs an illicit market for the drug. Most experts agree, however, that the black market for methadone stems more from methadone's ability to relieve withdrawal then from its euphorigenic effects (87). Since some people regard any drug use pejoratively, methadone programs have often used low doses, which have resulted in insufficient treatment (10). As noted above and discussed in chapter 4, daily doses below 30 to 50 mg are considered inappropriate, and effective daily doses have been found to average about 80 mg (66,130).

All methadone maintenance clients are opiate abusers and an increasing number of them use other drugs, including cocaine (184). Compared with clients of other treatment modalities, outpatient methadone maintenance clients were more likely to be older, black or Hispanic, and married and to have had prior treatment admissions (149). It should be noted that generalizations about typical client characteristics may be confounded by such issues as the geographic location of programs (112).

Naltrexone--Naltrexone is a pure narcotic antagonist[3] that was developed for the treatment of narcotics addiction in the early 1970s and approved by FDA in 1984. Naltrexone has the ability to block the euphorigenic and dependence-producing properties of opiates. Because antagonists are structurally similar to narcotics, they can occupy the same opiate receptor sites as narcotics. Even if heroin is used, as long as the dose does not exceed the amount blocked by the narcotic antagonist, the patient will not experience the pleasurable effect of the heroin.

One caveat about naltrexone's administration and potential benefit is that it must be given to persons who are no longer physically dependent on opiates. If naltrexone is administered to a heroin-dependent person, the familiar opiate withdrawal symptoms will develop. These symptoms can be reversed by a large dose of heroin (or other opiate) (247). In order for

[2]Montana stated that its hospitals use clonidine to detoxify patients. Although this survey was not able to determine why particular States did not provide methadone, some State statutes preclude the use of methadone, while other States responded that they do not have a narcotics problem (214).

[3]A pure or full antagonist is a drug that has only antagonist actions, whereas a partial antagonist has both agonist and antagonist actions.

naltrexone to block opiates' effects without producing unpleasant withdrawal symptoms, patients must be off all narcotics for a period of at least 5-10 days before naltrexone is administered. When taking naltrexone, the individual knows that the euphorigenic effect of heroin is no longer available and may stop taking heroin (35). The potential usefulness of narcotic antagonists lies in helping former opiate users remain abstinent after detoxification (247).

A single dose of naltrexone effectively blocks opiates for up to three days and produces few side effects (247). Narcotic antagonists, such as naltrexone, are not dependence producing. Although this is a positive facet of the drug, it has the drawback of lacking the built-in compliance mechanism associated with methadone (303). Thus, individuals can easily stop taking naltrexone without any ill effects if they want to use heroin. In fact, poor compliance with naltrexone treatment has been a significant issue and strategies to improve compliance with narcotic antagonists are being explored (180). Addicts who are very motivated to stay off drugs are most likely to benefit from naltrexone treatment.

Levo-Alpha-Acetyl-Methadol (LAAM)--Developed in Germany around 1948 as a potential painkiller, LAAM, like methadone, is a narcotic agonist . Of the drugs under investigation by NIDA, LAAM is the agency's most immediate priority (320). Problems with policies allowing narcotics abusers to take methadone home, such as accidental poisoning and street diversion of methadone, prompted the search for a longer-acting methadone substitute (194). Because LAAM can suppress withdrawal symptoms for up to 3 days after oral administration, it needs to be administered only 3 times a week instead of 7 (320). Less frequent doses free staff to engage in more therapeutic activities, such as counseling and other support services. It also helps break the drug abuser's routine of ingesting a drug daily and decreases the degree of psychological dependence (194). LAAM's longer action seems to produce a smoother, flatter effect with slower onset than methadone (35).

LAAM's side-effects are generally those seen acutely with opiates, including nausea, vomiting, constipation, excessive sweating, and decreased sexual interest (194). The possibility of acute overdose, especially with sedative-hypnotics during the beginning of LAAM's treatment, is one of LAAM's major problems. Patients should be especially warned against using additional opiates and central nervous system depressants, such as alcohol, for several hours after taking LAAM (194).

Biometrics Research Institute has recently been awarded a NIDA contract to sponsor LAAM thorough the remainder of its required FDA approval and to undertake the manufacturing and marketing of the drug (35). If approved by the FDA, LAAM would provide an additional agonist besides methadone to treat narcotic abuse.

Pharmacotheraphy for Cocaine Abuse

Although FDA has approved no medications for the treatment of cocaine abuse, NIDA is investigating numerous possibilities (see table 3-1). Most of these drugs are only in the early stages of development, and more research is needed to understand exactly whether and how they work to combat cocaine abuse. Many researchers feel that the potential effectiveness of these medicines lies in their ability to reduce the intense craving for cocaine that abusers experience during and after withdrawal (303). Although not much is known about the specific physiological mechanisms that induce craving, neurotransmission (the body's means of translating experience into sensations) is thought to play an important role. Three neurotransmitters have been implicated in the psychoactivity and withdrawal from stimulants: dopamine, norepinephrine, and serotinin (178). Researchers hypothesize that in order to reduce the pleasurable effects of cocaine, and thus the craving for the drug, medications will have to counter the effects of cocaine on neurotransmission, possibly by altering the production or reception of dopamine (303).

Many of the drugs under investigation for cocaine abuse treatment are FDA-approved for other illnesses. The most promising of these drugs have been antidepressants, such as desipramine and imipramine (303). Although research data are limited, initial clinical trials have suggested that desipramine offers promise as a way of initiating

abstinence and the process of recovery in cocaine-dependent outpatients by decreasing cocaine use and craving (115,117,176). Desipramine therapy represents a new class of substance abuse treatment that speeds the recovery of the central nervous system (117).

Pharmacotheraphies for Polydrug Abuse

Although the efficacy of methadone treatment for controlling opiate abuse has been well documented (see ch. 4), many clinicians have observed that methadone alone is poorly suited to control concurrent cocaine, alcohol, or other drug abuse among opiate addicts (182,184). Although methadone blocks the euphoria produced by heroin through cross tolerance, cocaine euphoria is not dampened by methadone (184).

Buprenorphine has been the most promising drug under development for users of both heroin and cocaine. Buprenorphine is a partial agonist, meaning that it has less agonist effect as the dose of buprenorphine increases (35). Researchers have hypothesized that the effectiveness of buprenorphine lies in its ability to deprive cocaine users of the relief that heroin use can provide in alleviating post-cocaine depression, thus indirectly making cocaine use less enticing. Like methadone, one dose of buprenorphine blocks withdrawal symptoms for 24 hours. Buprenorphine also offers two improvements over methadone. Buprenorphine has less chance of stimulating an illicit market, because its agonist effect is weaker than methadone's, and it entails a smaller chance of overdose (211).

Because depression appears to be associated with escalating cocaine use among methadone patients, desipramine and other antidepressants may also be helpful in treating cocaine-abusing, methadone-treated patients (184).

Drug-Free Treatment Approaches

Unlike detoxification and other pharmacotherapies, which rely on medications to treat withdrawal, drug-free treatments have traditionally allowed the use of chemical agents for only medical or psychiatric reasons. Because detoxification should be completed before entry into drug-free programs and clients should be considered manageable without the use of medications, the emphasis of these programs has been on developing a responsible drug-free lifestyle, not on managing the withdrawal process.

Therapeutic Communities (TCs)

The first well-known self-help TC was Synanon, which started in 1958. Daytop Village, Phoenix House, and many other residential TCs have patterned themselves after the general Synanon approach. The philosophy behind the TC is the belief that drug abuse is a disorder of the whole person, reflecting psychological dysfunction affecting some or all areas of function, including chronic deficits in social and occupational skills (76,155). Unlike pharmacotherapies, which consider drug abuse a medical condition, TCs view abuse as a symptom of underlying personality and behavioral problems that can and should be changed.

Cole and James identified three approaches to residential TCs that are distinguished by length of treatment and treatment goals (61).

- *Traditional TCs* generally entail at least 15 months in treatment. The primary goal of traditional TCs is a complete change in lifestyle, reflected in abstinence from drugs, elimination of antisocial (criminal) behavior, and development of employable skills, self-reliance, and personal honesty (83). The abuser's return to society as a productive and independent individual (habilitation and rehabilitation) is regarded as feasible and is encouraged.
- *Modified TCs* usually last 6 to 9 months. The modified TC approach has more limited goals that emphasize leading a drug-free life and acquiring practical skills to help the abuser function in society (149).
- *Short-term TCs* typically last 3 to 6 months. This type of TC does not emphasize resocialization, but instead concentrates on eliminating drug use, reestablishing family relations, and developing useful skills (149).

Residential TCs are distinguished from other treatment modalities by their highly structured approach. Members are assigned work duties, participate in group counseling, recreational, and other

activities, and attend educational and vocational training. The community itself functions as the primary therapeutic milieu. TCs have historically relied on program graduates who are ex-abusers to act as counselors, administrators, and, most importantly, as role models for incoming clients. Increasingly, however, as the spectrum of individuals entering TCs has broadened, non-TC persons are constituting a larger portion of the staffing, both clinical and auxiliary (155). Confrontation and peer pressure are commonly used to socialize individuals into more productive behavior.

Within the general TC structure, individuals are expected to pass through basic phases of treatment. The Phoenix House Program in New York City, the nation's largest TC treatment system, leads residents through three phases of treatment (76). In the *Induction Phase* (lasting 1 to 30 days), members are oriented to the concepts, rules, and resources of the TC. Individuals are assessed according to the extent of psychological disturbance and social deficits rather than by patterns or types of drug use as is common in pharmacotherapy modalities (76). During the *Primary Treatment Phase* (2 to 12 months of residency), members work toward the achievement of social and psychological goals through participation in daily activities. The principles of self-help (the person's readiness and commitment to change), motivation (the use of positive and negative pressures to change), and social learning (the emphasis on lifestyle changes, increased social responsibility, and establishment of new social contacts) are all considered essential to the rehabilitative approach (76). Finally, the *Re-entry Phase* (13 to 24 months) emphasizes vocational, educational, and job development skills (emphasis varies depending on the program) in addition to work and group therapy. Ways to deal with the stresses and frustrations that will occur when patients leave the program are dealt with during this final phase of treatment (76).

Unlike methadone maintenance programs, which are only applicable to narcotic abusers, residential TCs serve a wider variety of patients (149,170). According to a study by Hubbard et al., residential clients were somewhat more likely to be male and to have been more criminally active (probably reflecting the courts preference for this modality as a referral for individuals involved with the criminal justice system) and heavy alcohol users before entering treatment (149). Compared with outpatient methadone maintenance and ODF clients, residential clients were least likely to be married, perhaps indicating the difficulty married clients have leaving their families to live in a 24-hour residential facility.

Outpatient Drug-Free (ODF) Treatment

ODF programs represent a diverse collection of programs with little in common beyond their drug-free approach and outpatient setting. ODF programs were originally developed as a low cost alternative to residential care, to serve nontraditional, nonopiate abuser clients (13). The primary goal of ODF programs is abstinence from illicit drugs. These programs typically offer short-term treatment (less than 6 months), encourage involvement with self-help groups, such as AA, and make referrals to community agencies for health, educational, housing, and other services rather than providing those services in house. Like TCs, ODF programs vary in their approaches and intensity.

As noted earlier, day care, evening care, and halfway houses are becoming more common. Other types of ODF programs include mental health treatment centers, vocational programs, and family therapy for adolescents (203).

ODF clients have been more likely to be white, better educated, and seeking treatment for the first time than clients of other treatment modalities (149). Again, some of these generalizations about client characteristics may be confounded by the geographic location of ODF programs.

Other Inpatient Programs

The two main types of inpatient programs are "12 step" and psychiatrically-oriented programs (170).

Developed in the 1950s for the treatment of alcoholism, the Minnesota Model or "12-step" approach is becoming more common, especially since the onset of the cocaine epidemic (105). These short-term residential facilities provide intensive structured treatment for chemically dependent individuals. The programs typically operate in hospitals

or free standing units and last from 25 to 35 days (357). The counseling and other activities of these programs are derived from AA's "12 steps to recovery," which include the admission of addiction, acknowledgement of one's impotence to stop it without the help of a higher power, and the need to confront the harm one has done (105).

In an analysis of inpatient treatment programs in Minnesota, the typical client was noted to be a white male, 18 to 29 years of age, who has never been married and who has obtained a high school diploma (357). Following completion, patients are usually referred to AA or Cocaine Anonymous groups. Inpatient residential programs are almost exclusively private and are not part of the publicly funded treatment system (105). They have been used primarily to treat alcoholics and more recently to treat cocaine abuse. An explanation for the scarcity of narcotics abusers in this modality is that some residential programs are not able or willing to use methadone and may not want to wait to detoxify heroin addicts (35).

Psychiatric inpatient programs appear to be geared towards older or middle class drug abusers, adolescents drug users, and drug abusers with significant psychiatric problems (170). These programs usually begin with detoxification, followed by a variety of approaches (e.g., individual, group, and family counseling; education; required attendance at AA, Narcotics Anonymous, or Cocaine Anonymous meetings), and typically last between 4 to 12 weeks (170).

Self-Help Groups

These mutual-support groups grew out of the 12-step philosophy of AA programs. Most AA, Narcotics Anonymous, and Cocaine Anonymous programs are based on volunteer activities run by recovering abusers and are rarely linked to established social service agencies (149). Although self-help programs can be the primary source of treatment for some abusers, they also can serve as adjuncts or aftercare to other, more intensive treatment programs. The philosophy that underlies these programs is that there is no cure for drug dependence and that even if a drug-dependent person is no longer abusing drugs, she or he will always live with that dependence. One of the hallmarks of AA programs is that they do not believe in treating chemical dependencies with chemicals, but rather stress social and community support.

The Role of Multimodality Treatment

The forerunners of the relatively new and still infrequent multimodality programming were experimental treatment programs run by Jerome Jaffe in Chicago and Herbert Kleber in New Haven. These programs had a central admission unit where abusers received information about treatment options and were evaluated by staff to determine which program seemed best for the patient (170). The multimodality process offers the possibility of transferring patients between programs as their needs indicate (170). This approach has the added benefit of facilitating standard assessment procedures that can enhance evaluation and research (170). Such treatment systems, though in their infancy, move toward achieving what many experts find extremely desirable, a treatment system that is integrated, comprehensive, flexible, and based on a long-term case management approach (11).

TREATMENT PROGRAMS IN THE UNITED STATES

Introduction

The number of treatment facilities for drug abuse in the United States is not well documented, and information on private clinics and self-help programs is especially limited (13). Information on the cost of drug treatment is also scarce. Two national surveys provide the most useful information available on substance abuse treatment centers, namely the National Drug and Alcoholism Treatment Unit Survey (NDATUS) and the State Alcohol and Drug Abuse Profile (SADAP). Both NDATUS and SADAP analyze data voluntarily submitted from States and report current information on funding, services provided, client characteristics, and other important issues regarding treatment for abuse of alcohol and other drugs. NDATUS is a point-prevalence survey that reports on clients in public and private treatment at a point in time. SADAP surveys State alcohol and drug abuse directors about admissions to programs

that received public funds during the previous fiscal year. Because any one person could have multiple admissions during the year, SADAP does not reflect the number of people in treatment.

NDATUS: Description and Results

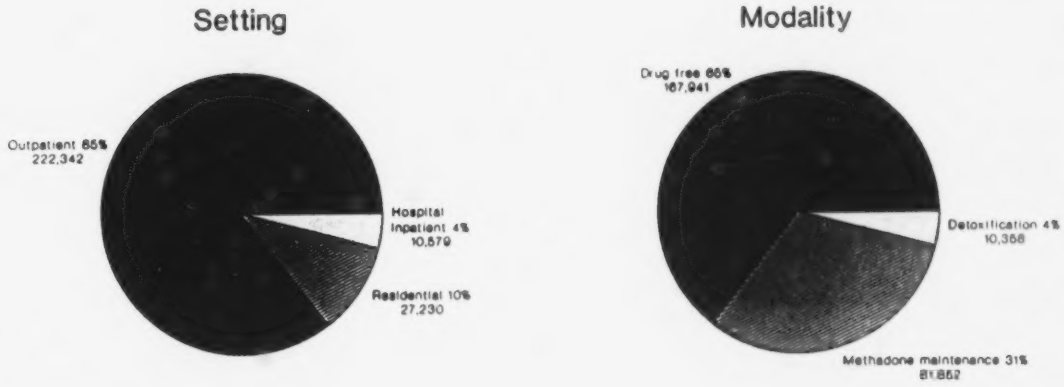
NDATUS is conducted with the cooperation of NIDA, the National Institute on Alcohol Abuse and Alcoholism (NIAAA), the Veterans Administration, the Federal Prison System, and the State Alcohol and Drug Agencies (332). NDATUS has been conducted periodically since 1973. The most recent NDATUS report is based on information collected from treatment programs as of October 30, 1987. Although the capability of the Federal Government for routine monitoring of treatment clients was eliminated in 1981 with the advent of the Federal block-grant program, that capability was restored with the Anti-Drug Abuse Act of 1988 (Public Law 100-670), which mandates States to collect client data as well as annual surveys (NDATUS) of services provided in drug treatment programs. Information on the location and type of the treatment units, sources of funding, client characteristics, client capacity, and utilization is collected from alcohol and other drug treatment programs in all 50 States, the District of Columbia, and Puerto Rico. NDATUS is the only survey that includes privately as well as publicly funded programs. One of the primary uses of NDATUS is to update NIDA's master file of all known alcoholism and other drug treatment and prevention facilities. This list is used to provide referrals to persons seeking help for drug dependency problems (332).

According to the latest NDATUS report, in October 1987 1,075 units for the treatment of drugs of abuse other than alcohol and 4,083 combined alcohol and other drug units were serving 263,510 drug abuse clients (332). A total of 4,403 units reported funds for drug abuse treatment totaling $1.31 billion. State funds (including Alcohol, Drug Abuse, and Mental Health Services (ADMS) block grants[4]) accounted for the highest proportion (27.1 percent) of drug treatment funds that the centers received. Federal funds other than block grants accounted for 3.6 percent; local government and State/local government fees for services 10.6 percent; other public funds, including public welfare and public third-party payers 14.9 percent; private funds, including donations, private third-party payers, and client fees 40.6 percent; and other funds 3.1 percent (see app. G for 1989 NDATUS results).

A total of 5,015 units (1,067 drug abuse units and 3,948 combined alcohol and other drug abuse units) provided information on budgeted capacity, utilization rates, and treatment modality. These units reported 260,151 drug abuse clients in treatment in October 1987. A very high proportion of these clients (85.5 percent) were served in outpatient settings (figure 3-1). The treatment modality serving the largest number of drug abuse clients was drug-free treatment, which includes drug-free treatment in both outpatient and inpatient settings, (64.5 percent), followed by methadone maintenance (31.5 percent) and detoxification (4.0 percent) (figure 3-1). Utilization rates (percent of capacity filled) varied considerably by treatment modality, from 89.3 percent in methadone maintenance to 76.8 percent in drug-free treatment and 55.9 percent in detoxification programs. According to drug treatment center ownership, private, non-profit units accounted for the largest number of drug treatment units, treated the largest number of clients, and had the largest capacity (see table 3-2). The lowest total utilization rate among drug treatment only units was observed among private, for-profit units (73.2 percent), while the highest utilization rate was for private, non-profit units (94.0 percent), followed by public, State/local units (93.7 percent) (table 3-2).

[4]The Omnibus Reconciliation Act of 1981 (Public Law 97-35) provided that ADMS block grants be administered by the individual States rather than using NIDA to administer funds (292).

Figure 3-1--Drug Abuse Clients in Treatment by Setting and Modality According to the National Drug and Alcoholism Treatment Unit Survey (NDATUS),[a] Oct. 30, 1987



[a]NDATUS reports information collected from both privately and publicly funded alcohol and other drug treatment programs. These data were reported by 5,015 units (1,067 drug treatment only units and 3,948 combined alcohol and other drug treatment units).

SOURCE: U.S. DHHS, NIDA and NIAAA (332)

Table 3-2--Information on Drug Abuse Treatment Units, from the National Drug and Alcoholism Treatment Unit Survey (NDATUS),[a] Oct. 30, 1987

	Unit ownership				
	Private		Public		
Unit orientation	For-profit	Non-profit	State/local	Federal	Total
Drugs other than alcohol					
Number of units	83	705	266	13	1,067
Number of clients	14,372	87,843	39,202	1,846	143,263
Budgeted capacity	19,629	93,426	41,844	2,286	157,185
Percent of capacity used	73.2	94.0	93.7	80.8	91.1
Alcohol and Other Drugs Combined					
Number of units	645	2,595	604	104	3,948
Number of clients	14,498	71,235	24,875	6,280	116,888
Budgeted capacity	27,621	105,154	30,699	8,179	171,653
Percent of capacity used	52.5	67.7	81.0	76.8	68.1
Total					
Number of units	728	3,300	870	117	5,015
Number of clients	28,870	159,078	64,077	8,126	260,151
Budgeted capacity	47,250	198,580	72,543	10,465	328,838
Percent of capacity used	61.1	80.1	88.3	77.6	79.1

[a]NDATUS is a point-prevalence survey that reports information collected from both privately and publicly funded alcohol and other drug treatment programs. Data in this table relate only to units that reported budgeted capacity.

SOURCE: US DHHS, NIDA and NIAAA (332).

NDATUS data support the findings that residential and inpatient clients tend to be younger than outpatient clients and that the proportion of females is lower in inpatient settings. Overall, two-thirds of the clients for whom sex was known were males. Blacks represented about one-fourth and Hispanics about one-sixth of the drug abuse clients for whom race or ethnicity was known, with the proportion of blacks and Hispanics especially high in methadone maintenance programs.

Overall, the estimated 110,816 intravenous (IV) drug users represented 42.1 percent of the total number of drug abuse clients (332). Although just 17.3 percent of clients in drug-free treatment were IV drug users, the percentages were much higher in detoxification and methadone maintenance programs, 43 percent and 90 percent, respectively.

SADAP: Description and Results

The other national survey on drug abuse centers in the United States is SADAP, which has been conducted annually since 1984. SADAP is based on a National Association of State Alcohol and Drug Abuse Directors (NASADAD) survey of State alcohol and drug abuse agencies regarding alcohol and other drug abuse treatment expenditures and admissions. Unlike NDATUS, which collects information on both private and public treatment facilities, SADAP looks only at those programs that received at least some funds administered by the State alcohol and drug agency (45). Although a substantial number of programs are not captured in the State reports, SADAP results represent the majority of programs using public funds (13). NASADAD receives support for SADAP activities from NIAAA and NIDA.

Forty-eight States, the District of Columbia, Guam, Puerto Rico, and the Virgin Islands participated in the fiscal year 1988 SADAP. According to reports from the alcohol and drug abuse agencies in these States and territories, 1,614 drug treatment units other than alcohol units and 3,506 combined alcohol and other drug treatment units received State alcohol and drug abuse agency funds in fiscal year 1988 (see table 3-3 for the number of drug treatment units in 1988 according to State) (45).

In 1988, 518,851 drug client admissions were reported by agencies in 47 States, the District of Columbia, Guam, Puerto Rico, and the Virgin Islands (45). Although drug use and client treatment admission patterns vary greatly across States, some general patterns emerge. In terms of treatment setting, nearly 70 percent of client admissions were to outpatient settings and 23 percent were to residential facilities (figure 3-2). Client admissions by treatment modality showed that 69 percent of clients were admitted to drug-free treatment programs, almost 20 percent to detoxification programs, and 10 percent to methadone maintenance programs (figure 3-2). Two-thirds of admissions to drug treatment were males, while 52.7 percent were white, 25.3 percent were black, and 11.8 percent were Hispanic.[5]

In 1988, cocaine surpassed heroin as the drug that clients entering drug treatment cited most often as the primary drug of abuse (139,663 v. 116,854) (45). Cocaine admissions as the primary drug of abuse were up 55 percent in fiscal year 1988, while heroin admissions increased 19 percent during the year. States varied in their drug abuse patterns. Cocaine was the primary drug of abuse other than alcohol related to treatment admissions in 18 States, the District of Columbia, and the Virgin Islands; heroin was the primary drug of abuse in 8 States, Guam and Puerto Rico; and marijuana and hashish was the primary drug of abuse in 15 States.

For fiscal year 1988, 43 respondents reported 162,929 IV drug abuser admissions to State-funded programs. According to estimates from 36 States, the District of Columbia, and Guam, the total number of IV drug abusers across the country was greater than 1.3 million (table 3-4) (45). The highest estimates of IV drug abusers were provided by New York (260,000), California (222,000), and Pennsylvania (115,000), while the lowest estimates were provided by West Virginia (200), Nebraska (870), and Maine (950).

[5]Asian or Pacific Islanders accounted for 0.4 percent of admissions, Native Americans 0.9 percent, and others 0.4 percent. The percentage of clients that did not specify race/ethnicity was 8.4 percent (45).

Table 3-3--Number of Alcohol or Drug Treatment Units by State Alcohol or Drug Agencies According to the State Alcohol and Drug Abuse Profile Data (SADAP), Fiscal Year 1988

State	Alcohol treatment units	Other drug treatment units	Combined alcohol/other drug treatment units	Total treatment units
Alabama	22	6	67	95
Alaska	0	2	39	41
Arkansas	26	18	112	156
California	635	282	0	917
Colorado	51	6	35	92
Connecticut	27	32	37	96
Delaware	4	4	7	15
District of Columbia	4	14	8	26
Florida	N.A.	N.A.	105	105
Georgia	0	4	41	45
Guam	0	0	1	1
Hawaii	1	1	16	18
Idaho	0	0	45	45
Illinois	166	70	34	270
Indiana	0	0	60	60
Iowa	0	0	30	30
Kansas	2	1	40	43
Kentucky	0	0	132	132
Louisiana	0	0	43	43
Maine	0	0	39	39
Maryland	93	154	85	332
Massachusetts	0	7	241	248
Michigan	0	0	283	283
Minnesota	0	0	232	232
Mississippi	26	0	53	79
Missouri	2	4	62	68
Montana	1	3	26	30
Nebraska	0	0	118	118
Nevada	5	1	20	26
New Hampshire	0	5	29	34
New Jersey	151	69	16	236
New Mexico	N.A.	N.A.	N.A.	N.A.
New York (A)	311	0	59	370
New York (D)	0	544		544
North Carolina	23	7	41	71
North Dakota	0	0	11	11
Ohio	103	151	67	321
Oklahoma	N.A.	N.A.	48	48
Oregon	32	4	90	126
Pennsylvania	26	21	276	323
Puerto Rico	12	146	3	161
Rhode Island	15	9	22	46
South Carolina	2	0	38	40
South Dakota	0	0	25	25
Tennessee	0	0	48	48
Texas	2	0	101	103
Utah	8	1	53	62
Vermont	0	0	23	23
Virgin Islands	N.A.	N.A.	4	4
Virginia	17	12	58	87
Washington	35	29	72	136
West Virginia	0	0	70	70
Wisconsin	0	2	322	324
Wyoming	N.A.	N.A.	N.A.	N.A.
Totals	1,806	1,614	3,506	6,929
Percent of total	26.1%	23.3%	50.6%	100.0%

ABBREVIATION: N.A. = Information not available.

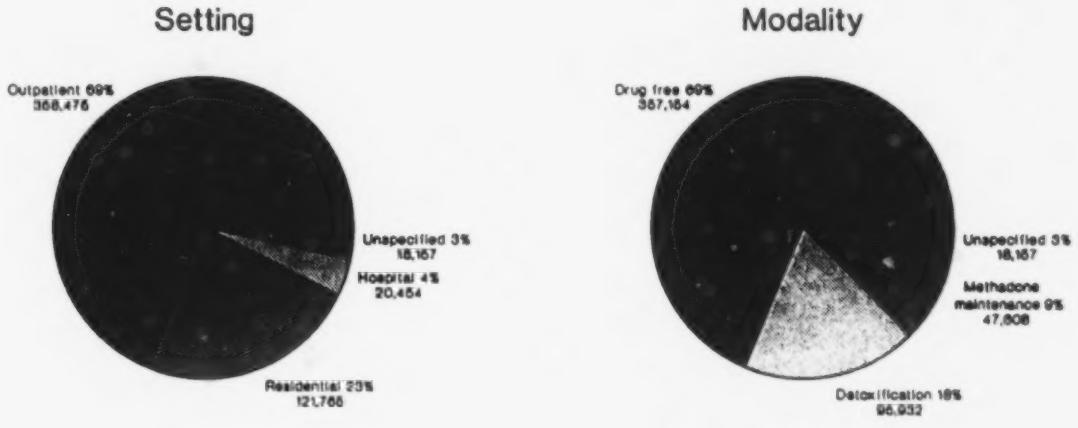
SOURCE: Butynski, Canova, and Jensen (45).

Table 3-4--Estimated Admissions of IV Drug Abusers and Total IV Drug Abusers, by State, Fiscal Year 1988[a]

State	Estimated number of admissions of IV drug abusers		Total number of IV drug abusers
	State-funded programs	Other programs	
Alabama	NA	NA	10,250
Alaska	564	118	3,410
Arizona	2,336	NA	38,263
Arkansas	815	NA	8,150
California	38,058	29,071[b]	222,000
Colorado	819	NA	12,000
Connecticut	4,833	241	35,000
Delaware	1,489	NA	13,368
District of Columbia	2,638	NA	16,000
Florida	8,511	3,059	65,614
Georgia	4,600	NA	27,600[c]
Guam	8	0	75
Hawaii	446	NA	10,000
Idaho	630	NA	2,517
Illinois	5,994	695	92,000
Indiana	2,026	4,233	28,220
Iowa	1,294	1,200	20,783
Kansas	700	1,255	NA
Kentucky	330	NA	5,000
Louisiana	NA	NA	NA
Maine	NA	NA	950
Maryland	8,105	1,439	42,000
Massachusetts	10,044	2,000	40,000
Michigan	4,000	3,000	NA
Minnesota	1,500	1,500	4,500
Mississippi	NA	NA	NA
Missouri	2,500	4,900	22,000
Montana	600	NA	2,500
Nebraska	218	NA	870
Nevada	870	200	5,800
New Hampshire	220	352	9,843
New Jersey	7,125	250	40,000
New Mexico	NA	NA	NA
New York	14,970	2,208	260,000
North Carolina	NA	NA	NA
North Dakota	NA	NA	50,100
Ohio	1,047	NA	NA
Oklahoma	NA	NA	NA
Oregon	2,253[d]	NA	25,000
Pennsylvania	12,500	200	115,000
Puerto Rico	4,942	NA	NA
Rhode Island	1,649	NA	8,245
South Carolina	1,000	NA	NA
South Dakota	112	41	1,530
Tennessee	1,729	NA	NA
Texas	4,807	4,800	60,000
Utah	840	NA	NA
Vermont	60	NA	NA
Virgin Islands	NA	NA	NA
Virginia	2,400	NA	NA
Washington	NA	NA	25,000
West Virginia	172	NA	200
Wisconsin	3,175	125	21,000
Wyoming	NA	NA	NA
Totals	162,929[e]	60,887[f]	1,344,788[g]

[a]Figures were compiled from estimates provided by State alcohol and drug agencies.
[b]Methadone clients only.
[c]Admissions only for metro Atlanta.
[d]Excludes IV drug abusers in drug detoxification.
[e]Based on responses from agencies in 40 States, the District of Columbia, Puerto Rico, and Guam.
[f]Based on responses from 21 States and Guam.
[g]Based on responses from 36 States, the District of Columbia, and Guam.
SOURCE: State Alcohol and Drug Abuse Profile, FY 1988 as cited in Butynski, Canova, and Jensen (45).

Figure 3-2--Admissions of Drug Abuse Clients by Setting and Modality According to the State Alcohol and Drug Abuse Profile (SADAP),[a] Fiscal Year 1988



[a]Includes data only for programs that received funds from State alcohol and drug agencies. Based on data collected from 46 State agencies, the District of Columbia, Guam, Puerto Rico, and the Virgin Islands.

SOURCE: W. Butynski, D. Canova, and S. Jensen (45).

Data submitted from 25 States, the District of Columbia, and Puerto Rico indicate that many States already have high rates of HIV infection among IV drug abusers (rates of infection were estimated to be as high as 60 percent in New York, New Jersey, and Puerto Rico) (45). Furthermore, these rates varied tremendously both across and within States. A total of 19 State agencies reported having at least one drug treatment program plan or model program on HIV and acquired immunodeficiency syndrome (AIDS) (ranging from State policies on AIDS and HIV/AIDS transmission prevention programs to surveys of AIDS-related knowledge).

Some of the most frequently mentioned policy issues identified by respondents to NASADAD's 1988 SADAP data collection effort include needs in the following areas:

- new or expanded treatment services (48 States);
- prevention and treatment services for special populations (e.g., indigent, homeless, polydrug users, women, and criminal justice clients)(23 States);
- funding and improved resource allocation (19 States);
- prevention and treatment services for youth (16 States); and
- expanded services related specifically to AIDS and IV drug users (16 States) (45).

The Extent of HIV Testing and Counseling

As of April 1990, the Centers for Disease Control (CDC) supported 63 HIV prevention programs

through the health departments in 50 States, 4 cities, the District of Columbia, 7 territories, and Puerto Rico (342).[6] CDC funds States and cities for HIV prevention and HIV/AIDS surveillance activities through cooperative agreements. The total dollar amount earmarked for counseling, testing, and partner notification for all types of sites was $89.24 million for fiscal year 1989. Of this total, drug treatment centers received 15 percent ($13.5 million) for HIV counseling and testing and an additional $5.0 million for health education and risk reduction (including street outreach) (350). In fiscal year 1990, $98.87 was awarded to all sites for these activities, with 15 percent ($15.056 million) going to drug treatment centers for HIV counseling and testing and $4.3 million for health education and risk reduction.

From 1985 through 1989, the number of counseling and testing sites in the 63 programs increased from 1,577 to 5,013. Despite the fact that drug users are at high risk for HIV infection in 1989, only 173 (3.5 percent) of these sites were in drug treatment centers. The percentage of counseling and testing sites in other settings included:

- free-standing HIV counseling and testing sites (25.9 percent)
- sexually transmitted diseases clinics (17.5 percent),
- family planning clinics (12.6 percent),
- other health department sites (10.4 percent),
- prenatal/obstetric clinics (10.1 percent),
- tuberculosis clinics (8.8 percent),
- private physicians offices and clinics (3.7 percent),
- other nonhealth department testing sites (3.2 percent),
- prisons (2.2 percent),
- colleges (0.6 percent), and
- unclassified facilities (1.6 percent) (342).

[6]In addition to the HIV counseling and testing sites included in the CDC programs, a large but unknown number of persons are tested in hospitals, outpatient medical facilities, physicians' offices, blood-donation centers, military facilities, and other settings (342).

As of July 1990, at least 253 drug treatment centers throughout the country were providing HIV counseling and testing (113). In New York City, approximately 2 percent (13 out of 713 drug treatment centers) provide HIV counseling and testing, while in the State of Connecticut, as many as 24 percent (9 out of 37 drug treatment centers) provide such services (350) (table 3-5). It is not uncommon, however, for programs to refuse to admit drug abuse clients if they test positive for HIV infection (87).

Shortages of Treatment Slots

In certain areas of the country with large numbers of drug abusers, especially in large metropolitan areas, publicly funded treatment programs are filled to capacity. Waiting lists for admission to treatment programs are one indication that the treatment system is not meeting the demand for treatment. During this waiting period, many intravenous drug abusers continue to put themselves at risk of contracting and spreading HIV by using drugs intravenously, and may also lose their resolve to enter treatment. There are several problems, however, with using waiting lists to measure unmet demand for treatment. Waiting lists may underestimate shortages of treatment slots to the extent that lengthy lists deter drug abusers from applying. Programs are also not required to keep waiting lists, and some programs that do keep them stop adding to the list after a certain point.

Table 3-5--Drug Treatment Centers Providing Human Immunodeficiency Virus (HIV) Counseling, Testing, and Partner Notification in Selected States and New York City, 1990

State/city	Number (percent) of drug treatment centers with HIV services	Total number of drug treatment centers
Connecticut	9 (24%)	37
Florida	23 (11%)	216
Houston	6 (8%)	79
New York City	13 (2%)	713
Texas	27 (7%)	365

SOURCE: US DHHS, CDC (350).

Despite these limitations, waiting lists do provide a measure of the unmet demand for treatment. The most recent national information available is from a NASADAD survey conducted in September 1989. Estimates from respondents of 44 States and the District of Columbia put the total number of people on treatment waiting lists at almost 67,000 (table 3-6) (252). Approximately 50 percent of those on waiting lists had been waiting for treatment for at least 30 days. New York, New Jersey, and the District of Columbia estimated that the average time between request and admission to outpatient programs was two months and Michigan estimate it to be three months. Several other States indicated that waiting lists for outpatient drug treatment was not a problem. Estimates of the time between request and admission to residential programs were generally longer than for outpatient treatment, with several States indicating average waiting times of three to four months.

Information on the Cost of Treatment

Treatment costs vary across cities and programs due to differences in staff salaries, cost-of-living, specific services provided, the age and type of building, and other related factors (217). Few estimates of program costs are available. In addition, existing cost estimates are often outdated, based on a limited number of programs, or only the best guesses of treatment experts (359). Besides cost per day and cost per year estimates, cost per treatment episode is also relevant, as the average length of treatment varies by modality. Suggestions for improving measures of drug treatment costs and a review of current cost estimate research efforts are presented in Wallack's testimony before the House Government Operations Committee in April 1990 (359). Past estimates have suggested that, per person, the cost of residential drug treatment is about three times the cost of outpatient methadone or ODF treatment (149,359).

From a meeting of experts sponsored by NASADAD in September 1987, the estimated annual cost of drug treatment per treatment slot for needle users was $2,300 for ODF treatment, $3,000 for outpatient methadone maintenance, $14,600 for adult non-hospital residential drug-free treatment, and $18,000 for adolescent non-hospital residential drug-free treatment (252). Average length of stay was not taken into account in these estimates.

Table 3-6--Estimates of Waiting Lists for Alcohol and Other Drug Treatment, Sept. 29, 1989[a]

	Total number on waiting list	Estimated average days between request for and admission to treatment	
		Outpatient	Inpatient
Alaska	386	14	66
Arizona	4,418	36	79
Arkansas	246	0	22
California	6,000	NA	NA
Connecticut	1,100	10	15
Delaware	575	49	120
District of Columbia	773	60	90-120
Florida	2,040	30	60-90
Georgia	1,000	0	21
Hawaii	200	7	14
Idaho	200	15	25
Indiana	1,285	21	24
Iowa	1,892	45	30
Kansas	250	5-10	30-45
Kentucky	659	30	16
Louisiana	1,500	7	38[b]
Maine	1,200	14-21	0-90
Maryland	3,350	40	30
Massachusetts	1,200	14	45
Michigan	7,500	90	120
Minnesota	198	3	25
Mississippi	556	37	18
Missouri	898	14	45
Montana	300	10	60-90
Nebraska	100	3	20
Nevada	750	10	40
New Hampshire	200	14	40
New Jersey	1,593	59[c]	
New Mexico	485	6	13[d]
New York - drug	4,891	65	49
New York - alcohol	2,166	NA	NA
North Carolina	2,096	10	22
North Dakota	135	7	50-60
Ohio	1,208	26	35
Oregon	2,887	3-5	14-30
Pennsylvania	1,500	51	56
Rhode Island	500	NA	45-60
South Carolina	300-500	NA	42
Texas	1,277	NA	NA
Utah	330	21	NA
Vermont	108	14	20
Virginia	2,829	NA	NA
Washington	115	2	30
West Virginia	110	34	65
Wisconsin	5,070	15-25	20-40
Wyoming	300	15-30	45
Total	66,766	(ave.) 22	(ave.) 45

ABBREVIATIONS: ave. = average; NA = not available.

[a]Voluntary reports from public and private treatment programs in 44 States and the District of Columbia. Waiting lists most likely underestimate the number who cannot obtain treatment because of a shortage of treatment positions (see text).

[b]Percent waiting at least 30 days is for public residential programs.

[c]Average for outpatient and residential.

[d]Waiting list number reflects survey of 89 percent of publicly funded programs.

SOURCE: Rua (252).

SUMMARY OF THE FINDINGS

The diverse treatment needs of drug abusers have led to the development of a variety of treatment modalities and programs in the United States. The primary treatment modalities have been methadone maintenance for opiate abusers (primarily heroin abusers) and residential TCs and ODFs for both opiate and nonopiate abusers.

The treatment system has evolved somewhat during the past decade, partly in response to the spread of HIV, the increasing number of cocaine abusers, and innovative treatment approaches are being tried. Research is currently underway to develop medications for treatment of cocaine for which no effective medications currently exists and to develop alternative medications for treatment of heroin addiction. In addition to methadone maintenance, several other pharmacological treatments have been developed based on an understanding of the basic neurology of opiate dependence, including clonidine for detoxification, rapid detoxification using naltrexone with clonidine, and reduction in opiate dependence using the partial agonist buprenorphine (178). One of the pharmacotherapies that has shown promise in reducing cocaine craving and use is the antidepressant desipramine. A diverse group of ODF programs and short-term inpatient programs are also becoming more popular.

Needs for services concerned with AIDS are more likely to appear in methadone treatment than in ODF programs (240). Methadone maintenance programs serve drug users at highest risk of HIV infection, including intravenous heroin users and an increasing number of intravenous cocaine users. Since methadone maintenance programs operate as outpatient facilities, the annual cost per treatment slot for needle users is much lower than that of residential programs, by one estimate, $3,000 compared with $14,600 (252).

Several States do not have methadone programs. In 1988, at least 8 States had no methadone programs and 3 States had methadone detoxification but no maintenance (213). Federal, State, and individual program policies regulate allowable methadone dosage; a thorough evaluation of State regulations of methadone programs would greatly enhance understanding in this area (214). It appears that only a small number of drug treatment programs (about 250) provide HIV counseling and testing, despite the high risk that drug users have of contracting HIV infection.

Total clients in treatment programs according to NDATUS in October 1987 was about 260,000, while the number of drug abuse admissions according to SADAP for fiscal year 1988 was about 519,000. Because SADAP is a voluntary survey and includes only programs that receive at least some funding from State alcohol and drug agencies, 519,000 should be considered an underestimate of the actual number of drug admissions during 1988. Both NDATUS and SADAP report that the vast majority of clients were enrolled in outpatient programs (85 and 69 percent, respectively) and that greater proportions were in drug-free treatment than methadone maintenance (65 v. 31 percent and 69 v. 9 percent, respectively).

In October 1987, IV drug users were 42 percent of all drug abuse clients reported through NDATUS. The percentage of IV drug-using clients was highest in the detoxification and methadone maintenance modalities (332). Estimates from 36 States, the District of Columbia, and Guam responding to the 1988 SADAP put the total number of IV drug abusers at 1.3 million, with estimates varying extensively by State. Rates of HIV infection among IV drug abusers varied as well, with estimates as high as 60 percent in New York, New Jersey, and Puerto Rico. The need for services related specifically to AIDS and IV drug users was listed as a top priority by 16 States (45). Although waiting lists have limitations as a measurement of unmet demand, they do provide an indication of the extent of the problem. One study showed that almost 67,000 drug abusers were on waiting lists to enter treatment programs, with some States having average time between interview and admission of 2 months or more (252).

Chapter 4

THE EFFECTIVENESS OF TREATMENT FOR DRUG ABUSE

INTRODUCTION

This chapter examines the effectiveness of treatment for drug abuse and dependence as a first step in examining its role in preventing the spread of human immunodeficiency virus (HIV) infection (see ch. 1). This chapter begins with an overview of the natural history of drug abuse, particularly with respect to heroin abusers. Next a discussion of the major methodological problems in examining the effectiveness of drug abuse treatment is presented. The core of the chapter describes the results from major studies and addresses other issues related to treatment for drug abuse.

NATURAL HISTORY OF DRUG ABUSE

Overview of Drug Abuse Careers

Drug abuse is a complex, multidimensional, chronic condition. Several theoretical models have been proposed to explain the causes of drug abuse (13,169,367). They range from theories of genetic predisposition and metabolic deficiencies to theories based on psychoanalytic principles and social learning. The lack of agreement on a single cause of drug abuse has been likened to Voltaire's saying that, "A long dispute means that both parties are wrong." It might be more appropriate, however, to conclude that both parties are right. The empirical evidence does not exclusively support one model over the others, but rather suggests that elements from all the models play a role in the initiation and maintenance of abusive behavior.

The enormity of the problem lies, in part, in the fact that drug abuse is a condition that has a long course, in most cases lasting a decade or more. A simple framework highlights the necessary ingredients in the making of a drug abuser, namely "a susceptible person, an abusable drug, and some mechanism to bring the two together" (169). These three factors interact during the whole course of drug abuse. Multiple paths lead in and out of this career, which is characterized by four stages: initiation, maintenance, cessation, and relapse (65,158,267,268). Findings of a landmark study on drug abuse showed that the average length of time from first use to last daily opiate use was almost 10 years, and that over the course of a 12-year followup, over two-thirds of clients had relapsed one or more times to daily opiate use (157,267,268). Individual susceptibility to relapsing into drug use is at the core of this cycle and can be explained by a variety of factors that may interact or operate independently (169). These factors may stem from biological, psychological, or socioeconomic conditions, and their roles may vary during the different stages of the abuse career.

Not everyone who experiments with drugs will become a casual user, and not all casual users will escalate into full-fledged abuse or dependence (addiction) (13,104). Abuse refers to a pattern of use that results in harm to the user; the user continues use despite adverse consequences. Dependence, on the other hand, is characterized by compulsive behavior and the active pursuit of a lifestyle that centers around searching for, obtaining, and using the drug. Dependence refers to the most severe state in the drug-use spectrum; the patterns of use of psychoactive substances range from experimental, occasional, and recreational use to abuse and to compulsive use, which characterizes dependence. Although treatment is intended for those dependent on drugs, the term drug abuse as used in this report encompasses both abuse and dependence.

Not all substances have the same potential for dependence, and individual biological differences may affect whether particular individuals become dependent on a drug. There is inadequate research to determine precisely the likelihood that a casual user will become addicted to various substances. Some experts hypothesize that upper estimates may be 1 out of 10 persons for alcohol or marijuana, about 3 to 5 out of 10 persons for intranasal use of cocaine and about 8 to 9 out of 10 for those who smoke or inject heroin or cocaine or smoke crack (169).

The emerging consensus with respect to cessation of daily opiate use is that it "is not simply a direct result of growing older or 'maturing out' of abuse" (267,268). Detailed and long-term followup studies with regard to cocaine are not available. Overall, however, it appears that the process of phasing out drugs is a function of a wide range of factors that also play a role in an abuser's decision to seek treatment. A "threshold point" usually arrives when the negative consequences of drug abuse outweigh the rewards derived from drug use (169,267). Previous treatment episodes, criminal justice involvement, life events, and other social conditions may converge towards slowing, or completely discontinuing drug use (11).

Natural history studies are extremely helpful in gaining insight and understanding the course of drug abuse. Clearly there is a need for more such studies, especially with regard to cocaine abuse and its routes of administration.

In general, according to the Office of the National Drug Control Strategy, not everyone who has a serious drug problem, defined as using drugs at least 200 times in the preceding 12 months, will require formal treatment to overcome the problem (104). Some (perhaps one out of four such users) may be able to overcome their drug problems with their own psychological resources and the help of friends, clergy, and other support groups (104). Drug treatment is intended mainly for people who are drug dependent (238). Because of the chronic relapsing nature of drug abuse, however, a single treatment episode will usually be insufficient; an individual may require multiple courses of treatment to move towards recovery (149,201).

Several studies have examined the course of drug abuse careers. Most of them, however, are over 20 years old and may not reflect current patterns. The majority studied samples of predominantly heroin abusers who received treatment for drug problems that in most of the cases started before 1960 (268). Similar studies are not available for those who abuse cocaine. Some of the reported studies on heroin use suffer from a variety of methodological problems, including presenting the findings in general descriptive form and rarely employing sophisticated quantitative analyses, such as multivariate analysis (268).

Heroin Abuse

Overall, these long-term followup studies have showed a trend towards reduced narcotic use and increased abstinence with the passage of time (197,268). Vaillant summarized the results from several American and European studies of heroin abusers who were hospitalized to be treated for their heroin abuse. He concluded that following initial hospital treatment, 10 percent of the narcotic abusers would never relapse, another 15 percent would be abstinent by the fifth year after treatment, and an additional 15 percent would be abstinent by the tenth year (352). Vaillant also claimed that almost 50 percent of narcotic abusers who achieve abstinence for one year would eventually relapse. Based on an 18-year followup of treated heroin abusers, Vaillant estimated that the annual recovery rate is 2 percent (352). Thus, the 10-year recovery rate ranged from 22 to 40 percent, depending on which study was used to derive the estimate. One should keep in mind, however, that these studies are over 20 years old and may not reflect current characteristics of drug users and patterns of drug use (e.g., use of multiple drugs) (203).

In contrast to the above studies, which examined the course of treated abusers, Waldorf and Biernacki studied the natural recovery from opiate abuse. They analyzed data from a non-random sample of 142 former heroin abusers (355,356). Half had been treated before, and half had never received formal treatment. The two samples were matched by age, sex, and race. There were no major differences found between the two samples with respect to background variables that reflected the extent of drug abuse, work experience, and education. Although there were no differences in the variables that measured motivation, more heroin abusers in the treated sample than the untreated sample established new relationships (71 percent v. 54.9 percent, respectively) and used social services, which may reflect referrals from the treatment centers. In-depth interviews revealed three distinct lifestyles of opiate abusers: the street abuser, the middle-class abuser, and the situational abuser. In contrast to the other two types, the situational abuser uses drugs in certain occasions depending on availability and has not developed the stereotype lifestyle or philosophy associated with drug use. Overall, six different patterns

of recovery were identified in their sample: 1) developmental change, which is basically maturation; 2) conversion to a spiritual, religious, or ideological group; 3) behavioral change as a result of environmental changes; 4) maintenance of the lifestyle, but cessation of drug use; 5) occurrence of alcoholism or mental illness; and 6) drifting into the mainstream of society.

Cocaine Abuse

Cocaine use is characterized by a binge pattern (241). Cocaine may be used continuously until either physiological exhaustion occurs or the drug or money is depleted. Following a binge, users go through several well-defined stages; relapse may occur at any time. Initial depression and high cocaine craving followed by a clinical syndrome resembling a retarded depression characterize the post-cocaine crash, which lasts up to 4 days. Next comes a withdrawal phase, lasting up to 10 weeks, which is characterized by initial euphoria and a false sense of control followed by increased cocaine craving and an associated syndrome characterized by anhedonia and dysphoria.[1] During the third stage of abstinence, the subject returns to normal mood; however, occasional craving for cocaine may be triggered by myriad conditional cues reflecting the extremely reinforcing nature of cocaine. "A potential for relapse continues as long as conditioned cues exist to produce craving" (114,116).

The natural history of cocaine abuse has not been extensively studied. Thus, knowledge about how the course of cocaine abuse may differ between treated and untreated individuals and according to the route of the drug's administration is limited. A recent study shed some light on cocaine abusers who enter treatment. The study examined the pre-treatment natural history of cocaine abuse in 285 male veterans who were admitted during 1988 and 1989 to the Veterans Administration (VA) Medical Center in Los Angeles (165). The investigators examined the period between first cocaine use and entry into treatment. The majority of the study subjects (95 percent) were entering treatment for the first time.

The mean age of first cocaine use for this group was 24, and the average total time from first cocaine use to treatment entry was 11.5 years (165). Intranasal cocaine and crack were the most prevalent forms of cocaine use (74 and 72 percent, respectively), with subjects reporting more than one route of administration. It was observed, however, that from first use to treatment entry and as subjects approached treatment, crack use increased and shifted from intranasal use and other routes of administration to crack smoking.

Four patterns of progression in cocaine use were identified: mild-moderate-severe, mild-severe, moderate-severe, and instantly severe (165). Forty-four percent of the sample reported that they started cocaine use at a mild level and subsequently engaged in severe use. An additional 30 percent started instantly with severe use; 17 percent was classified into the mild-moderate-severe group; and the remaining 10 percent started with moderate use that was followed by severe use. The results indicated that although the majority of cocaine abusers were able to maintain mild use for a considerable length of time, once they engaged in a level of moderate use, they escalated fairly rapidly to severe use.

METHODOLOGICAL PROBLEMS IN THE EVALUATION OF TREATMENT EFFECTIVENESS

Evaluation research involving human behavior poses great difficulties. The core of the problem lies in the difficulty of establishing a causal relationship between the intervention (e.g., treatment for drug abuse) and the observed outcome (e.g., reduction in drug use or criminal activity). Ideally, in an experimental setting, the scientist can control relevant conditions that may affect the outcome, thus making the link between cause and effect easier to establish. This is not always the case with human subjects; the investigator may be either unaware of or unable to control all extraneous factors that relate to the intervention and the outcome. Such factors may distort the observed findings and make the connection between treatment and observed outcome less clear.

[1] Anhedonia is the absence of feelings of pleasure in acts that normally give pleasure. Dysthymia is an emotional state with depression of less intense degree than seen in manic-depressive disorders.

The main objective of evaluation research is to analyze whether there is a causal link between an intervention and an observed outcome. First and foremost, causal interpretation relies on the premise that in the absence of the intervention (treatment), the treated would have had the same outcomes as the untreated. Second, in the event of an observed treatment effect, the aim is to identify the factors that may have caused this effect. In study design, the primary concern is to ensure the internal and external validity of a particular study. Internal validity has been described as the *sine qua non* of causal inference (63). It refers to the likelihood that an observed outcome can be attributed to the specific intervention and not to some extraneous factor. External validity, on the other hand, refers to the generalizeability of the observed results to different settings and populations. It is concerned with the issue of whether the inference drawn from the actual subjects of the study may also be applied to people outside the study population.

Biases in the design and implementation stages of a study may seriously threaten internal validity. These biases, which have particular relevance to the evaluation of treatment for drug abuse, fall into three main categories: selection bias, information bias, and confounding factors (249).

Selection bias refers to any recognized or unrecognized, measured or unmeasured correlates of the study subjects that influence the probability of their being part of the study or choosing a specific treatment intervention and that may also influence the treatment outcome. Strong personal motivation to enter treatment combined with self-selection into a particular modality or facility is a predominant example. Special elements in this category with direct relevance to the treatment of drug abuse are factors relating to the history (specific events occurring during the course of drug abuse) and maturation (possible biological and psychological processes and changes within subjects during the course of drug abuse) of subjects. These factors affect the natural history of the condition. In addition, they may either directly or indirectly influence both the decision to seek treatment and the outcome of treatment.

Information bias refers to any distortion in the process of getting the necessary information to evaluate the effect of the intervention. For example, researchers may perform a more aggressive and probing interview for only some of the subjects or may extract outcome information from available records that are incomplete or unavailable for all the subjects.

Lastly, confounding refers to the distortion of the findings by any extraneous factor other than self-selection that is related to the treatment and is also predictive of the outcome. An example is a low, ineffective dose of methadone. Reduction of opiate use is related to adequate methadone dose, usually higher than 60 mg per day (257). On the other hand, in many methadone clinics the mean average dose is well below 60 mg (see section on methadone maintenance below) (299). Thus, results from evaluation studies that do not control for daily methadone dose may inaccurately suggest that methadone is ineffective.

Problems relating to the feasibility of various study designs and the assessment and measurement of treatment and its outcomes are additional hurdles in evaluating the effectiveness of treatment for drug abuse. Treatment outcomes may also be influenced by a variety of intrapersonal, social, and environmental factors.

Study Design

The ideal experimental study of the effectiveness of treatment for drug abuse would use a random sample of all drug abusers randomly assigned to the various treatment modalities. Random assignment would improve internal validity by equally distributing, or at least having minimum variation in, those extraneous factors that may affect the validity of the comparisons among different groups. Random sampling would improve external validity by generating a representative sample of all abusers.

The nature of drug abuse often makes such a study difficult. Drug use is an illicit behavior, and drug abusers are a heterogeneous group with multiple personal and social problems. Identifying all

drug abusers to draw a representative sample, gaining their cooperation, and sustaining their commitment to treatment may not be realistic goals. Whether a sample of drug abusers is representative, however, bears on the generalizability of the results, not on the internal validity of the study and not on the immediate question of treatment effectiveness. On the other hand, even if a non-representative group is willing to enter treatment, the ability to assess a treatment's effectiveness is compromised if drug abusers refuse to enter the treatment modalities assigned.

When an experimental design is not a feasible option, the best alternative is the quasi-experimental design, which is based on epidemiologic principles and observational research. It should be stressed, however, that the further removed the design is from the sound principles of experimental research, the harder it is to establish a causal link between treatment and outcome. Epidemiologic studies try to simulate as much as possible the setting of an experimental design. Although the investigator does not have control over all of the relevant variables and circumstances, partial control can be accomplished through careful identification, documentation, and measurement of the known relevant factors that may influence the outcome. The essence of the situation, however, is that when non-equivalent groups are studied, biases are more likely to occur. It thus becomes harder to separate the effect of treatment from the effect of those factors that are associated with the initial non-comparability of the study groups.

Prospective studies usually offer a more complete picture of treatment effectiveness than retrospective studies. Although a prospective design has the potential to eliminate some major sources of bias, it is not trouble-free. For example, adherence to the study protocol is essential to ensure that it was the intended treatment that produced the observed findings. Another problem that can seriously hamper interpretation is the attrition of patients during treatment and followup. If, for example, the patients who drop out of treatment early or who are harder to locate afterwards are those who were resistant to treatment and poorly motivated, then the results would tend to overestimate the impact of treatment.

Another critical issue is whether direct comparisons may be made among the different modalities with regard to their effectiveness. There is considerable evidence that the various modalities attract different client groups (128,149). This heterogeneity in the baseline population can compromise the comparative interpretation of any differences, since they may involve non-comparable groups.

The majority of treatment effectiveness studies use a quasi-experimental research design. Randomization among drug abuse treatment modalities has been employed in two studies. One randomized patients to methadone maintenance or residential treatment, yet produced results that were hard to interpret because of poor adherence to the study design (19). The other, a randomized blinded study of methadone v. placebo, produced meaningful results (227). Randomized studies are more common in the evaluation of specific treatment components (59,140,202,375).

Although earlier studies suffered from an abundance of methodological problems, considerable progress has occurred with advances in the measurement of variables, study design, and statistical analysis of the results.

Definition of Treatment and Outcome

The actual definition, measurement, and assessment of both treatments and outcomes pose additional challenges. Treatment for drug abuse is a process that occurs over a period of time. Multiple treatment episodes may be needed for improvement or abstinence from drug use. Defining the treatment period and deciding when to measure the results of treatment may greatly influence the results. For example, for methadone maintenance (whose goal is to reduce or eliminate heroin use while the patient is receiving methadone, measurement of outcomes has occurred during ongoing treatment; however, for therapeutic communities (whose goal is a drug-free lifestyle after treatment completion), outcome measurement has begun after the client has left or completed the program. Choice of followup time after treatment is also a challenge. Outcome estimation after 1-year followup may more accurately

reflect a treatment's impact than outcomes at longer followups, which may reflect a combination of the treatment's impact and other influences on the drug abuser's life (271).

A critical issue is the use of subjective or objective measures in measuring the outcome of interest. Ideally, an experimental study would include objective measures of outcome that can be easily reproduced. Although someone would expect that self-reports of illegal behaviors, such as drug use or criminality, could severely compromise scientific studies by underreporting, at least for opiates, "measurement research indicates strong agreement between addicts' self reports and other sources of information on their opiate use, employment, and crime" (202). Another expert review on measurement in drug abuse surveys concluded that an investigator through careful, thoughtful planning, and use of creative procedures, "should be able to collect acceptably reliable and valid data on the drug-using behavior of respondents in most populations" (161). Caution, however, is warranted, and corroboration of self-reports with objective measures is always a desirable ingredient in drug abuse studies.

The challenge of treatment effectiveness research is not only to establish whether any observed changes are attributed to the intervention but also to identify the most effective and most ineffective elements of treatment. Treatment consists of several components, such as drug education and counseling; urine testing; psychotherapy; medications; and educational, vocational, and other social support (13). Modalities also vary in the goals of treatment (most notably drug-free v. maintenance). Moreover, even within the same modality, there is variation in the provision and quality of services and the settings in which they are offered.

Drug abuse is a disorder that affects many aspects of abusers' lives and the society within which they function. This reality has certain implications for the objectives of drug abuse treatment. The first and foremost goal of drug treatment is cessation of illicit drug use. Also important are other outcomes, including a decrease in criminal activity, increase in social productivity, and improvements in mental and physical health (13). Defining and measuring these outcome categories further complicate the task of treatment evaluation.

An additional factor in reviewing evidence of treatment effectiveness is the possibility of publication bias. To the extent that publications reject studies that report negative findings (no treatment effect), the published literature will overestimate treatment effectiveness.

Summary

In summary, the evaluation of drug abuse treatment poses significant challenges. Controlled experiments, although difficult to design and conduct, are increasingly becoming more common. A wide array of factors complicate the assessment of treatment effectiveness. The chronic relapsing pattern of drug abuse, the heterogeneous composition of the drug-abusing population, and the problems created by patient self-selection of treatment modalities are some of the problems researchers face. In addition, the difficulty of specifying often intangible treatment components, such as the overall profile of the program with the complex interactions of patient expectations and staff's abilities and attitudes, may further exacerbate the evaluators' task (13).

Improvements in study design and analysis are expected to strengthen the validity of research results. In the meantime, evaluations of adequately designed and implemented studies that provide consistent evidence may provide useful information for social policy. When one analyzes existing scientific knowledge on the effectiveness of treatment of drug abuse and its policy implications, it is useful to recall the words of Bradford Hill, one of the pioneers in establishing standard criteria for causal inference:

> All scientific work is incomplete-whether it be observational or experimental. All scientific work is liable to be upset or modified by advancing knowledge. That does not confer upon us a freedom to ignore the knowledge we already have, or to postpone the action that it appears to demand at a given time (142).

DARP AND TOPS: A DESCRIPTION OF THE TWO NATIONAL MULTIMODALITY STUDIES

Much of the collective knowledge of treatment effectiveness, such as general characteristics of clients in the various modalities, the natural history of abuse, and factors related to treatment effectiveness, stems from two large federally-funded studies. The Drug Abuse Reporting Program (DARP) begun in 1969 and the Treatment Outcome Prospective Study (TOPS) begun in 1979 examined different treatment modalities throughout the United States. Because of their significant contribution to the field of drug abuse research, these two studies are described in detail below.

Drug Abuse Reporting Program (DARP)

DARP, the first comprehensive large-scale evaluation project, was initiated in 1969 as a national data collection system to evaluate community-based treatment centers (268). The need for such action arose after the treatment expansion that took place during the late 1960s. Funded by the National Institute on Drug Abuse (NIDA) and conducted by the Institute for Behavioral Research of the Texas Christian University, DARP provided valuable information on a substantial segment of the clients in publicly funded drug abuse treatment centers. DARP also documented changes over time in treatment clientele and drugs used.

Between 1969 and 1974, approximately 44,000 clients in 52 treatment centers around the country were described and assessed (268). Standardized data collection instruments were used at client admission and bimonthly while clients were in treatment. These instruments measured client characteristics, type of drug used, alcohol consumption, productive activity (employment), and criminality.

These initial data served as a baseline for a series of followup studies on three admission cohorts clients entering treatment during 1969-71, 1971-72, and 1973-74 (269,270,271). Followup studies initiated in 1974 examined outcomes associated with the various treatment modalities. Followup assessment included a complete history of the type and duration of drug abuse treatment and gathered additional information on illegal drug use, criminality, and employment. Outcomes were reported only for people who, during the year of followup, had been out of treatment or out of jail for at least 3 months.

A total of 6,402 clients from 34 treatment centers participated. This randomly drawn sample included both males and females and was stratified for age, race-ethnicity, treatment type, length of time spent in treatment, and geographic location of the program. Overall, 83 percent (5,340 of those selected) were located, and 73 percent were interviewed face-to-face. All the major modalities were represented. Subsequently, there was also a 12-year followup study on a targeted sample of 697 black and white daily opiate users. Of this sample, 70 percent were interviewed; the remaining either refused (2 percent), were not located (20 percent), or were deceased (8 percent) (261,270,271). Although outcome measurement relied on self-reports, the investigators state that comparisons of a sample of self-reported data with urine testing results and criminal justice records provided evidence for the accuracy of self-reported data (267).

As the first large-scale, field-based evaluation of drug abuse treatment, DARP contributed substantially to the field of drug abuse research by addressing major methodological problems. For example, it established criteria for the definition and measurement of treatment, its characteristics, and associated outcomes.

It should be noted that the DARP findings presented in this report pertain mainly to users of opiates and only to white and black males, since these subgroups were consistently represented in all treatment groups in the followup samples.

Treatment Outcome Prospective Study (TOPS)

Conducted from 1979 to 1981, TOPS was the second large-scale, comprehensive, longitudinal evaluation study. This study built on the experience of the DARP study. Funded by NIDA and conducted by the Research Triangle Institute, TOPS provided more extensive information than DARP about the natural history of drug abusers (details

about drug abusers' lives before, during, and after treatment) and drug abuse treatment.

The study population included 11,750 clients from 41 programs across the country. Although these programs were purposely selected and did not represent a random sample of all publicly funded programs, the authors stated that they accurately reflected the types of clients and the range of treatment services available between 1979 and 1981 (147,149). The investigators arrived at this conclusion by comparing TOPS programs and clients with available national data on treatment programs and client characteristics.

Three admission cohorts were formed based on whether the clients entered treatment in 1979, 1980, or 1981. Clients in the three admission cohorts were interviewed at initial contact, 1 month into treatment, and at 3-month intervals while in treatment. Information was gathered on the types of drugs used, alcohol consumption, mental health, criminal behavior, and economic productivity. Those clients who entered the TOPS programs and completed the initial interview made up the population from which the followup samples were drawn. A total of 4,270 people formed the three stratified samples. Followup occurred at 3 months, 1 year, 2 years, and 3 to 5 years after leaving treatment. Response rates varied by modality and length of time since leaving treatment, with somewhat lower rates for methadone clients than those in therapeutic communities and outpatient drug-free programs (see ch. 3 for descriptions of the major treatment modalities). Of the initial sample, response rates ranged from 70 to 80 percent in each followup period up to 2 years and were about 65 percent for the 3- to 5-year followup. The investigators compared characteristics of respondents and non-respondents and concluded that the resulting bias from the non-respondents would not distort the study's conclusions.

The results from the TOPS study reported later in the chapter were based on approximately 10,000 clients in 37 programs representing all the major modalities and refer to those patients who spent at least 3 months in treatment. Three outcome measures, including drug use, criminal activity, and productivity, were used. Reductions in drug use were documented separately for heroin and cocaine. Criminal activity was measured as the self-reported involvement in predatory crimes (such as robbery, burglary, larceny), thus excluding crimes related directly to drug use, such as drug dealing. Productivity was measured by weeks of full-time employment. With respect to the reliability and validity of the self-reported data, the investigators stated that, "varied analyses demonstrate that the TOPS data are on the whole reliable and valid (149)."

In addition to reporting the prevalence of the above outcome measures, the investigators calculated 1-year abstinence and improvement rates. The abstinence rate for a specific drug is the proportion of people who were regular users in the year before treatment and who did not use the drug at all in the year after treatment. The improvement rate, a less strict criterion, is the proportion of regular users in the year prior to treatment who either ceased use completely or decreased the frequency the year following treatment. In contrast with the prevalence rates, which provide a robust picture of drug use, the latter measures provide information on changes among individuals who engaged in this behavior prior to treatment. It should be kept in mind that the abstinence and improvement rates reported in the following sections pertain to treatment clients who spent at least 3 months in treatment. The exact proportion of clients who remained in treatment for at least 3 months at each modality is reported separately in the respective sections.

TREATMENT EFFECTIVENESS

This section describes the results from the major studies on the effectiveness of drug abuse treatment. In evaluating treatment effectiveness, one should keep in mind that treatment goals differ among modalities. Treatment duration and graduation are basic concepts of therapeutic communities and outpatient drug free programs; the ultimate goal is drug-free status after treatment completion. For methadone maintenance, however, the goal is reduction or elimination of opiate use during treatment. In addition, drug-free status is a goal for some methadone maintenance programs.

Since most of the studies on treatment effectiveness are modality-specific, each of the major modalities will be addressed separately: methadone maintenance; other pharmacological agents including Levo-Alpha-Acetyl-Methadol (LAAM), naltrexone, and pharmacotherapies for cocaine abuse; therapeutic communities, and outpatient drug-free programs. A review of research on specific modalities is followed by a review of studies that relate to more than one modality. Next, results of the most recent cost-benefit analyses related to drug abuse treatment are presented. Finally, other contemporary issues related to treatment are addressed, including treatment of special populations, dual morbidity (the coexistence of both substance abuse and a psychiatric disorder), polydrug use (the concurrent use of more than one drug), relapse prevention, and aftercare services.

Methadone Maintenance

This treatment modality is directly related to prevention of HIV infection. Methadone maintenance is intended to curtail heroin use. Since most heroin abusers administer the drug intravenously, methadone maintenance by reducing heroin use, has the potential to interrupt a major route of HIV transmission.

Since 1964, when the first studies by Dole and Nyswanter were reported, hundreds of thousands of heroin abusers have been managed by methadone maintenance, and numerous articles have been written about this treatment modality. A literature search revealed approximately 13,000 articles on substance abuse in general, 4,000 of which referred to methadone maintenance (246). Methadone maintenance, "has been evaluated as much as any human service modality in history" (262). These evaluations have been either part of large multiprogram national studies or individual studies of specific programs. Many thorough reviews have examined the collective evidence for methadone maintenance effectiveness (13,39,66,68,262). This section will analyze findings from some of the major studies along with results reported by the review articles.

Randomized Experiments

Methadone Maintenance and Placebo--The first randomized, double-blind study of methadone maintenance effectiveness was conducted in Hong Kong between 1972 and 1975 among 100 heroin addicts who volunteered to participate (227). After all were stabilized on a daily dose of 60 mg of methadone, they were randomly assigned to two groups. The first group received methadone with an average dose of 97 mg per day. The second group, the control group, had their methadone gradually reduced by 1 mg per day to no methadone and thereafter were maintained on placebo. Both groups had access to a wide range of ancillary services and were followed for 3 years.

At the 8-month followup, there was a marked difference in the proportion of patients continuing treatment between the two groups (10 percent and 76 percent for the placebo and methadone maintenance groups, respectively) (227). After 3 years, 56 percent of the methadone group was still in treatment, in contrast to 2 percent of the control group (1 out of 50 placebo clients was still in treatment). With respect to illicit narcotic use, the investigators noted that evidence for persistent use of heroin (measured by urine testing) accounted for 31 of the 49 discharges (dropouts) of the control group. Among the treatment group, the proportion of patients with one or more urine samples positive for heroin rose initially to almost 60 percent but declined sharply and stabilized around 35 percent after the fourth month. Criminal activity, measured by the rate of convictions per man-month of enrollment, for the placebo group was more than double that for the treatment group (3.17 v. 1.41).

Methadone Maintenance and Therapeutic Communities--In 1980, Bale and his colleagues attempted to overcome the major methodological obstacles and perform a systematic comparison of methadone maintenance and therapeutic communities (19). They designed a prospective study, employing random assignment to the two modalities, and a followup of all patients regardless of retention in treatment. The study population comprised 585

male veterans who used heroin. These individuals were randomly assigned either to methadone maintenance or to one of three therapeutic communities participating in the study. Data were collected on drug use, criminal behavior, and work and school attendance. Patients were followed up to 1 year.

Only 108 patients entered the treatment modality to which they were initially assigned; another 103 waited a required period of 30 days and then they exercised their options to enter a different program (19). The methadone program retained 31 percent of those originally assigned, while 21 percent switched to residential treatment. With regard to those assigned to residential programs, 39 percent remained in the residential programs, and 9 percent entered methadone treatment. Forty-two percent of the sample spent no time in any treatment, except a detoxification program.

Among those in treatment, retention problems occurred. Although 74.5 percent of the total methadone maintenance clients remained in treatment for the first year, only 20 percent were still in therapeutic communities TC programs after the first 6 months. The 1-year outcomes (drug use, criminal activity, and work or school attendance) for all subjects in therapeutic communities and methadone maintenance showed no statistically significant differences. Overall, the study was severely compromised, especially because of veterans' refusal to enter the assigned treatment, high dropout rates, and the option to switch modalities. Because of these methodological problems, the results with respect to treatment effectiveness were rendered almost uninterpretable (13,128).

Multi-Program Nonrandomized Study

Ball and colleagues assessed the effectiveness of methadone maintenance in a cross-sectional study of six methadone maintenance programs in the Northeast (20). The study sample of 617 heroin abusers consisted of a stratified sample of new admissions and longer-term clients already in treatment for at least 6 months. The sample was further classified with respect to time in treatment with 126 new admissions, 342 moderate-stay clients (those with an average stay of 0.5 to 4.5 years), and 149 long-term clients (those with an average stay over 4.5 years). The 1-year retention rate was 63.4 percent for the moderate stay clients and 86.3 percent for the long-term group. The mean number of years of heroin use was 11.1 for the whole sample. Of those newly admitted, 66.7 percent said they had used heroin in the past 30 days, and 14.5 percent reported using other opiates. The prevalence of opiate use in the past 30 days was less than 100 percent because this sample included drug users who were in a transition period from jail, other incarceration, or detoxification to methadone maintenance. In addition to heroin use, 58 percent of those newly admitted reported using cocaine, and 38.7 percent reported using alcohol to intoxication. Table 4-1 presents the findings of the study according

Table 4-1—Percent Self-Reported Heroin Use and Crime by Males by Time in Methadone Maintenance Treatment, 1985[a]

Status in past 30 days	Last addiction period (N=617)	New admission sample (N=126)	In treatment 0.5 to 4.5 years (N=342)	In treatment 4.5 years (N=149)
No heroin use or crime	NA	25.4	65.5	83.2
Only heroin use	19.0	37.3	15.8	3.4
Only crime	NA	7.9	11.1	9.4
Both heroin use and crime	81.0	29.4	7.6	4.0
Total	100.0	100.0	100.0	100.0

ABBREVATION: NA = not available from the reference.

[a]The Chi square value for this table is 303.8, which is significant at the .01 level.
[b]The authors described this group as having been in transition during the previous 30 days.

SOURCE: Ball, Corty, Meyers, et al. (20).

to length of stay in methadone maintenance. There were four outcome measures: heroin use; criminal activity; both heroin use and criminal activity, and success, defined as no heroin use or criminal activity during the past 30 days.

Of those with moderate stays (0.5-4.5 years), 15.8 percent reported using heroin in the past 30 days and an additional 7.6 percent were involved with both heroin and crime (20). Overall, 65.5 percent of the moderate-stay sample were defined as successes, with no heroin use or criminal activity in the past 30 days. Even larger improvements were reported among those who remained in treatment for more than 4.5 years. Overall, 83.2 percent of these long-term clients were classified as successes. Heroin use was reported by only 3.4 percent of long-term clients, while an additional 4 percent were involved in both heroin and crime. The investigators also reported similar patterns of smaller rates of cocaine use and to a lesser degree alcohol use. Substantial differences in both heroin use and criminal activity were observed, especially for long-term methadone maintenance clients.

National Studies

DARP Study--The reported findings of the first- and third-year followups pertain to only white and black males who were admitted to treatment, regardless of the time they spent in treatment. Interviews were conducted with 73 percent of the sample targeted for followup (a random sample of all those who originally entered treatment) (see table 4-2) (272). Daily opiate use declined from 100 percent 2 months before treatment to 36 percent and 24 percent at the first and third years of followup, respectively.

Criminal activity was measured as the percentage of clients undergoing any arrest or incarceration during the year of followup. Of those entering methadone maintenance, a substantial majority (88 percent) had reported at least one arrest in their lifetimes (272). This proportion reporting any arrest was 27 and 20 percent, respectively, during the first and third years of followup. Similarly, any incarceration declined from 50 percent prior to treatment to 28 and 30 percent at 1- and 3-year followups.

At baseline (previous 12 months), 33 percent were employed half-time or more (272). During the third year after treatment, the proportion rose to 58 percent.

TOPS Study--The impact of methadone maintenance on heroin and cocaine drug use, criminal activity, and economic productivity are presented in table 4-3 (149). These findings pertain to

Table 4-2--Percent Self-Reported Opiate Use, Criminal Activity, and Employment by Males[a] in Methadone Maintenance Treatment, DARP

Category	Pre-treatment period[b]	During 1 year after treatment[c]	During 3 years after treatment[c]
Daily opiate use	100	36	24
Arrest	88	27	20
Incarceration	50	28	30
Employment half-time or more	33	57	58

[a]Statistics refer only to white and black males.
[b]The pre-treatment periods varied: 2 months for opiate use, lifetime for arrest and incarceration, and previous 12 months for employment.
[c]Average followup rates were 79 percent for cohorts admitted to treatment from 1969 to 1971 and from 1971 to 1972 and 64 percent for the cohort admitted in 1973 to 1974.

SOURCE: Simpson and Sells (272).

Table 4-3--Percent Self-Reported Drug Use, Criminal Activity, and Employment by Methadone Maintenance Clients Treated at Least 3 Months, TOPS[a]

Category	Year before treatment	3 months in treatment	3-months followup	1-year followup	2-year followup	3-5 year followup
Regular heroin use	63.5	5.9	16.0	16.7	14.9	17.5
Regular cocaine use[b]	26.4	9.4	17.4	17.5	12.0	16.5
Serious predatory crimes	31.8	9.8	18.8	19.0	15.2	16.2
Full-time employment	24.2	25.9	16.5	20.1	29.3	17.7

ABBREVIATION: NA = not available.

[a]No statistics on followup rates for clients treated at least 3 months were presented. For all those on methadone maintenance regardless of the duration of treatment, followup rates ranged from 75 percent for 3 months followup to 65 percent for 3-5 year followup.
[b]Weekly or more frequent use.

SOURCE: Hubbard, Marsden, Rachal, et al. (149).

methadone maintenance clients who had remained in treatment for at least 3 months; these clients represent nearly 69 percent of the sample targeted for followup (a stratified sample of those who completed intake procedures). The median time spent in treatment was approximately 7 months (147,149,150). The followup sample, however, includes those who were in long-term maintenance (approximately 25 percent of the sample).

During the year before admission to methadone maintenance, 63.5 percent of clients used heroin regularly. At 3 months after entry, only 5.9 percent were regular users (weekly or more frequent use) (149). This proportion increased gradually after treatment and stabilized at 17.5 percent (a threefold decrease from the pre-treatment level) at the 3- to 5-year followup (measured from date of admission). Improvement was also reflected in two other outcome measures, the abstinence and improvement rates. Of regular heroin users during the year before treatment, more than half had ceased heroin use altogether the year after treatment (abstinence rate). Similarly, 70 percent had either stopped or decreased their use in the year subsequent to treatment.

The original proportion of regular cocaine users during the year prior to treatment was 26.4 percent (149). This rate dropped to 9.4 percent after 3 months in treatment and increased gradually to 16.6 percent at the 3- to 5-year followup. The 1-year abstinence and improvement rates were 40 and 70 percent, respectively. This pattern of cocaine increase may reflect the resurgence and higher initiation rate of the drug in the early 1980s (149).

Criminal activity (measured as involvement in serious predatory illegal acts) showed similar decreasing patterns. During the year prior to treatment, 31.8 percent engaged in such activity (149). After being in treatment 3 months, the proportion dropped to 9.8 percent. Thereafter, the rate increased and stabilized at 16.2 percent at the 3- to 5-year followup (half of the rate during the year before treatment). Similarly, the investigators noted that two out of three clients reporting illegal acts prior to admission had ceased their involvement the year after treatment.

There was no major difference in the percentage of fully employed clients 1-year before admission and at the 3- to 5-year followup. In fact, a decrease was observed (24.2 declining to 17.7) (149). The improvement rate indicated that 18 percent of the clients had more weeks of full-time employment in the year after treatment. The strict outcome criterion (full-time employment) together with the lack of an adequate control group and the multitude of factors that influence employment may help explain the contrasting outcomes between the significant improvements in drug use and criminality, on one hand, and the overall unchanged level of economic productivity on the other.

Additional Studies on Crime Reduction

Anglin cites several additional studies from a variety of geographic locations across the country that demonstrate the effectiveness of methadone maintenance in reducing crime (13). In a study in San Antonio, Maddux and Desmond found that

methadone maintenance treatment rates were inversely related to community crime rates (198). Moreover, when funding reductions forced premature discharge of clients in the community, crime rates increased. Another study by Hunt and colleagues compared methadone maintenance clients with narcotic users not in treatment (151). Methadone maintenance clients were involved in less criminal activity, especially for serious crimes, such as robbery, burglary, and drug dealing. Finally, in summarizing the overall effects of methadone maintenance on crime, Ball and colleagues, in the study described earlier, found a consistent and uniform decrease in the 14 types of crime that they examined (20). Prior to treatment, people in the sample were involved in 306.8 mean crime days per year. For those in treatment for at least 6 months and less than 4.5 years, the reported mean crime days plummeted to 24 per year. A further reduction to 18 days was reported for those in treatment for more than 4.5 years.

Natural Experiments

The shortcoming of not having randomly assigned groups or an adequate control group is uncertainty in the interpretation of positive findings. In order to be able to conclude that treatment was the contributing factor, other plausible explanations should be excluded. Studies that take advantage of a policy or program change (natural experiment) and examine subsequent outcomes may provide less equivocal results (13,17,149). In his most recent review of the effectiveness literature, Anglin describes such studies. One study by McGlothlin and his colleagues examined the consequences of the involuntary termination of a methadone maintenance clinic in California (207). The 94 clients who were forcibly discharged were compared with a matched sample of 83 clients from another operating clinic. The 2-year followup showed that 54 percent of those forcefully discharged had reverted to heroin abuse. Those discharged were almost two times more likely to be arrested or incarcerated than the comparison group. Similar findings were reported from another study in San Diego, where some of the clients of a closed clinic transferred to private methadone maintenance programs, while others were unable or unwilling to do so (14). Higher rates of illicit drug use, crime, and drug dealing, and more contact with the criminal justice system were reported for those who did not transfer.

Maximum Achievable Effectiveness of Methadone Maintenance

For a recent presentation at a NIDA conference on treatment improvement, Kreek compiled the best reported outcome levels that properly run methadone maintenance programs can be expected to achieve (187). A distinction between primary and secondary treatment goals was made. The primary goals were reduction in heroin use and voluntary retention for more than 2 years. The best observed outcome with respect to the proportion of methadone maintenance clients abstaining from heroin was 85 to 98 percent (299). Overall, 2-year retention rates exceeded 65 percent. Secondary goals and the achieved levels were 1) reduction in cocaine use (30- to 40-percent decline) and alcohol abuse (20- to 30-percent decline); 2) reduction in criminality and antisocial behavior (more than a 70-percent decline in criminal acts and arrests reported in some programs); and 3) improvement in socialization and productivity including employment, resumption of education, and homemaking (60-percent improvement observed in some programs).

Factors Related to Treatment Effectiveness of Methadone Maintenance

Methadone maintenance clinics provide a wide spectrum of ancillary services to their clients, though they vary in the type, intensity, and quality of services offered. The core of these programs is the daily administration of methadone as a pharmacologic means of blocking the effects of opiates while simultaneously avoiding withdrawal, thus reducing their use. Variables related to the provision of both methadone and ancillary services have been identified as influencing treatment outcome to one degree or another. This section will focus on the methadone-related parameters. Other factors that relate to treatment effectiveness and cut across modalities will be reviewed at the end of the treatment effectiveness section (see section on Parameters Related to Treatment Outcome).

Methadone Dosage--There is great variability in the way individuals metabolize drugs, and this is certainly true for methadone. Beyond individual differences, some of the factors that have been found to influence the clearance of methadone from the body include other concurrent conditions, such as chronic diseases, the intake of other pharmacologic agents,

and pregnancy. Due to individual differences in the rate of methadone removal, what constitutes a dosage of methadone adequate to exert its pharmacologic action may differ from person to person. If the dose is inadequate, the methadone concentration in the blood may fall below a critical level before the administration of the next day's dosage, and the patient may experience symptoms of abstinence, which can lead to heroin use to relieve them (97,98,262). This pharmacologic reality supports the notion that methadone maintenance should be viewed as a procedure similar to providing pharmacotherapy to stabilize and maintain any other chronic condition, such as diabetes.

This view, which has a profound impact on how to determine an appropriate dose, is not shared by everyone. There have been two main arguments posed by methadone opponents: 1) that methadone is bad because it simply substitutes one opiate for another (which technically speaking is true) and 2) that providing methadone, and especially higher doses, will lead to increased illegal diversion of methadone (18).

The interplay of scientific, moral, and political arguments in the evolution of methadone policies has been examined and analyzed by Attewell and Gerstein (18). With respect to dosage policies, they note that the mean dosage levels of programs "became strategic symbols of their toughness and desire to wean abusers from methadone" (18). The authors argue that methadone dosage became "a pawn in an organizational struggle" that resulted in a steady decline in the average dose over the years.

A low dose of methadone has traditionally been one that is less than 40 mg a day, while a high dose has been defined as a dose over 60 mg a day (170).[2] The role of methadone dosage has been thoroughly examined in a critical review by Hargreaves, which was part of NIDA's landmark conference "Research on the Treatment of Narcotic Addiction: State of the Art" (130). With the research question "What evidence do we have that various methadone dose practices are more effective than others," a careful and analytic review of 22 studies covering 11 years of research was conducted. All 22 studies were evaluated for their quality and strength of evidence. The conclusion was that there is a dosage effect, especially early in treatment. The participating researchers further agreed that a daily dosage in the range of 50 to 100 mg with a mean around 80 mg would be sufficient for the majority of the patients. Evidence suggested, however, that for a substantial minority (10 to 30 percent) of patients, doses as high as 100 mg per day were superior to 50 mg, especially for the first 5 to 10 months of treatment. Furthermore, the researchers also agreed that higher dosages enhance retention in treatment, especially in the early phase, and lower rates of illicit drug use.

The final conclusion stated that, "no single methadone dose is best for all patients" (69). Researchers suggested that dosages be individualized for each patient. Although a daily dose of 100 mg or less is thought to be sufficient in most cases, some circumstances might require higher doses. On the other hand, methadone doses below 50 or 30 mg per day, are considered to be inappropriate (69).

The study of six methadone maintenance clinics in the Northeast by Ball and colleagues also examined the effect of dosage on opiate use (98). The data on dosage were pooled over all the programs, which had different policies and support services. Although these were cross-sectional data, there was a striking inverse relationship between daily methadone dose and the frequency of heroin use. At a daily dose of 35 mg or less, a little over one-third of the clients used heroin regularly. By contrast, at 80 mg per day, there was practically no opiate use.

With respect to dosage changes, a recent review of methadone maintenance treatment by Kreek further recommends that dose changes should not be used as a reward or punishment, but rather that dosage should be determined after a careful and scientific evaluation (186). The scientific reasoning for such a policy is that stable doses play a crucial role in normalizing the heroin-induced changes of

[2]The distinction between low and high dose used in the literature should not be confused with the distinction between effective and ineffective dose levels, as studies have indicated that 60 mg of methadone per day may be the lowest effective dose (257).

many physiological functions. Thus, an abrupt disruption of stable plasma levels could lead to relapse by initiating drug hunger and drug-seeking behavior.

Retention In Treatment--The study of the association of remaining in treatment with the degree of treatment effectiveness is a good example of the inherent limitations of drug abuse research. Many factors that may play a role in retaining clients in treatment (e.g., patients' characteristics, program variables, dosage, and other policies) may also have an impact on the outcomes and thus confound the real association between treatment retention and positive outcomes. Nevertheless, it is noteworthy that a wide variety of studies with different designs and data analysis sophistication have consistently found duration of treatment associated with outcome improvements. Retention rates in methadone maintenance, although higher than the other modalities, vary among different programs. Overall, the reported range for a 2-year period is from 55 to 85 percent (258). Retention is influenced by both client and treatment characteristics (68). Client factors associated with retention and better adjustment to methadone maintenance were older age, low criminal background, better employment history, and lack of psychopathology.

It should be noted that methodological problems impede generalizations and predictions. The most appropriate design, a randomized clinical trial, may be difficult to achieve. Even in observational or epidemiologically designed prospective studies, from which most of these results come, the existence of an unmeasured metabolic deficiency or biochemical difference could seriously confound and invalidate any prognostic ability of other factors. With respect to program characteristics, programs with more flexible strategies, including dosage policies, are reported to have superior retention records (13). A study comparing three programs found that flexible policy programs retained clients, on the average, 9 months longer than other programs (13). A multivariate analysis of the non-compliant clients in the study by Ball, et al., found that those patients on lower doses (less than 30 mg per day) had the higher risk of noncompliance, while program affiliation was not a significant factor. By contrast, however, noncompliance in the mid- and high-dose programs, was program related. The authors suggest that program policy, treatment procedures, and staffing patterns seemed to influence compliance rates (294).

At the NIDA "State of the Art" conference, there was also agreement that research findings indicate that patient performance (measured by drug use, employment, and criminality) is a good predictor of retention while the patient is still in treatment (69). The majority of researchers at the conference also agreed that the longer the duration of treatment, the more likely it was that a positive outcome would be sustained following treatment (66,72). The findings from the more recent TOPS study support these conclusions (149). Multivariate regression analysis of the TOPS data, which controlled for several factors, demonstrated that time in treatment was the strongest predictor of favorable outcomes (table 4-4). Significant results were demonstrated for those who

Table 4-4--Odds Ratios for Post-Treatment Outcomes in the First Year after Methadone Maintenance Treatment, by Treatment Duration, TOPS

	Time in treatment[a]				
Outcome	Comparison group < 1 week n = 86	1-13 weeks n = 161	14-52 weeks n = 268	> 52 weeks and discharged n = 137	Long-term maintenance n = 183
Regular heroin use[b]	1.00	1.16	0.83	0.47[c]	0.23[d]
Regular cocaine use[b]	1.00	1.2	1.05	0.59	1.11
Predatory crimes	1.00	0.81	0.81	0.59	0.36[d]
Full-time employment	1.00	0.70	1.13	1.74	1.44

[a]Self reports from 835 of the 1,539 clients who were sampled for followup.
[b]Weekly or more frequent use.
[c]$p < .05$
[d]$p < .001$
SOURCE: Hubbard, Marsden, Rachal, et al. (149).

had been in treatment continuously for 2 to 3 years, as is shown in table 4-4. Indeed, those in long-term maintenance were four times more likely to have decreased their regular heroin use (odds ratio=0.23) than those with less than 1 week in treatment (the comparison group). Similarly, those with more than 52 weeks in methadone maintenance were two times less likely to be engaged in regular heroin use (odds ratio=0.47) than the comparison group. Moreover, these long-term maintenance clients were three times less likely to engage in predatory illegal activity (odds ratio=0.36). With respect to client characteristics, it was found that females, Hispanics, users of heroin only, those with three or more previous drug abuse treatments, and those who were not heavy alcohol users were more likely to remain longer in treatment (149). All the above conclusions were the product of a multivariate analysis of a carefully designed prospective study, which further strengthened the existing evidence.

Other Treatment Correlates--Methadone maintenance programs differ substantially in their general program policies regarding dosage, admission, discharge, readmission, detoxification, urine testing, take-home privileges, and the provision of other positive or negative incentives to their clients. With the exception of dosage, none of these components have been extensively studied. Overall, though, it appears the answer is "a qualified yes" that the above elements do, indeed, affect treatment outcome (72). With respect to the provision of incentives, the evidence is neither consistent nor clear-cut. Stitzer and Kirby in a recent review reported that both positive incentives (such as take-home privileges) and negative incentives (threat of treatment termination) "have been shown to promote abstinence among some proportion of treatment patients" (285). Since the positive findings are not valid for all clients, however, the challenge is to identify and characterize those clients who can benefit the most from such measures. Similarly, more research is needed to establish whether and for whom the various policy components influence treatment outcomes.

Methadone maintenance programs also differ in various program characteristics that are part of the overall treatment environment (e.g., the type, range, and quality of services provided; the patient-to-staff ratio; and the staff background, expertise, and attitudes). The dynamic interplay of these factors constitutes what Anglin calls "program personality." Although these elements are not easily measurable or quantifiable, they have been found to influence treatment outcome (13,68). The extent to which these variables render their influence directly or indirectly by increasing retention and the duration of treatment is less clear. Ball's study of the six methadone maintenance programs described earlier provides evidence about the influence of program characteristics on treatment outcome (21). This study, despite its cross-sectional nature, suggests the extent to which differences among treatment programs may result in differences in effectiveness. Regardless of the initial selection of well-established methadone maintenance programs with above average patient-to-staff ratios, there was a wide disparity in each clinic's ability to decrease drug use. The proportion of current users while in treatment varied among the programs from 9.8 to 57.1 percent. Although it was hypothesized that the most powerful predictor of success would be patient characteristics, subsequent analysis suggested that certain program variables were more closely related to program success rates. The identified variables were dosage, retention rates, staff turnover rates, and the closeness of the relationship between staff and patients. According to the investigator, the study highlighted the importance of staff characteristics in influencing treatment outcomes. Anecdotal evidence from confidential interviews with program personnel also revealed a relationship between program morale and treatment effectiveness (21,241a).

Achieving a Drug-Free State--Researchers differ on what the ultimate goal of methadone treatment should be. Studies indicate that a drug-free state may not be a totally realistic goal, at least not for the majority of the patients, because of relapse (130). The overwhelming evidence is that the beneficial effects of methadone are mainly confined to the time when the client is still in treatment. In a review primarily of studies of methadone maintenance programs in New York City, which examined the fate of methadone maintenance clients who had left treatment or been discharged, the author states that "a consistent finding is that in NYC it is really hard to

achieve abstinence even for those clients who complete methadone maintenance and detoxify voluntarily" (130). Even those who have been favorably discharged face a less than 50 percent chance of maintaining abstinence for 3 years. Between 70 and 80 percent of discharged patients return to illicit opiate use within 1 to 2 years after leaving methadone maintenance (187,309). A study by Dole and Joseph, which examined the pattern of heroin use among patients with at least 3 interrupted cycles of treatment, found decreases in opiate use while in treatment, with subsequent increases in usage after leaving treatment (99).

Stimmel and his colleagues studied 335 former methadone maintenance clients to determine their ability to remain abstinent from narcotic use (283). The subjects were classified according to the reason that they were detoxified from methadone and left treatment: 17 percent were considered to have completed treatment, 30 percent were voluntarily discharged, another 30 percent violated the rules, and 24 percent were arrested. The followup rate was 80 percent with approximately 26 months followup time. At the end of the study period, 35 percent of the followup sample were narcotic-free, 58 percent had relapsed to narcotics, 4 percent were incarcerated, and another 4 percent had died. It should be noted that the mean duration of followup for those who remained narcotic-free was shorter than for those who relapsed. Thirty-five percent of relapses occurred among the group with 3 or more years of followup. Discriminant analysis was performed to identify factors associated with drug-free status. The dominant variable was reason for detoxification, followed by duration of methadone maintenance, and length of followup. Indeed, of those methadone maintenance clients that the program staff considered as having realized the full benefit from methadone maintenance, 83 percent were able to maintain abstinence, in contrast to 14 to 21 percent of those detoxified for other reasons.

As to what types of clients are more likely to achieve the goal of abstinence, researchers have found the most encouraging results with clients who are older, who have been stabilized in methadone maintenance for at least 2 to 3 years, who have psychological support, and who have demonstrated less criminality and better social functioning (13,187,262).

Medical Maintenance

An alternative experimental approach to the traditional daily dispensing of methadone at clinics is based on the concept of medical maintenance. This approach calls for stable, non-drug using, socially rehabilitated patients to take home as much as a 28-day supply of methadone from a physician at a primary care setting. Methadone is dispensed in tablet form and can be taken on a daily basis by the patient. The first published evaluation study examined 40 former heroin abusers who entered the program after they had met several well-defined criteria (230). The followup time ranged from 12 to 55 months. These preliminary results showed an annual retention rate of 94 percent. Overall, 8 of 40 patients (20 percent) relapsed into illicit drug use. This estimate includes five patients who returned to traditional methadone maintenance because of cocaine use. The authors argue that this approach has benefits for the clients (decreased frequency of visits and increased self-esteem), as well as for society (reduced cost and increased availability of methadone maintenance slots). There are, however, certain limitations of medical maintenance, probably the most important of which is the likelihood of illegal diversion of the large doses of methadone, whose street value can reach $2,400 for a 28-day supply (366).[3]

The medical maintenance concept has the potential for being a beneficial treatment approach for some clients. However, there is clearly a need to replicate the above findings, to address the various methodological concerns, and, most importantly, to identify those patients for whom it would be most helpful.

[3]The distribution of methadone, a synthetic opiate, is tightly controlled by Federal regulations. Methadone may be diverted into illegal channels because of demand created by people who seek to control withdrawal symptoms, to detoxify themselves, or to obtain the pleasant altered state of conciousness that methadone produces (68).

Summary of Methadone Maintenance Effectiveness

Methadone maintenance has been used to treat hundreds of thousands of heroin abusers over the past 25 years in a wide variety of social, economic, and geographical settings. Its safety and effectiveness have been established in numerous studies (13,66,68,69,72,170,262). For a substantial majority of opiate abusers, who enter methadone maintenance, drug use and criminality decrease and health status improves. On average, three-fourths of the clients on long-term maintenance cease illicit opiate use (258).

The consistency of the scientific literature regarding the safety, efficacy and effectiveness of methadone is overwhelming, yet some still consider methadone a controversial treatment modality (299). Methadone has been criticized for simply substituting one abuse with another, for not being as beneficial for cocaine and other drug abuse as it is for opiate abuse, for not producing a robust improvement in all the maladaptive behaviors associated with substance abuse, and for not achieving high enough outcomes even with regard to opiate use. As stated in NIDA's landmark review, although some criticism of methadone maintenance is warranted, much of it is not supported by the scientific data (66,72,167). With the connection between intravenous (IV) drug use and AIDS, the importance of resolving the issues of what can and cannot be accomplished with methadone treatment and how methadone maintenance's fullest potential can be achieved is becoming more prominent.

Two basic distinctions about methadone maintenance are important for evaluating this modality. The first distinction concerns the premise that methadone is a cure or a "magic bullet" for the drug epidemic as opposed to a pharmacologic substance to counterattack illicit opiate dependence. The second distinction concerns methadone's efficacy as opposed to its effectiveness.

Methadone, a synthetic opiate, can prevent both drug hunger and opiate withdrawal symptoms for 24 to 36 hours. When administered to tolerant patients, it causes no euphoria or sedation and in adequate doses can block the effects of heroin (187). This property makes methadone a drug-replacement therapy that allows an "illicit short-acting opiate administered with needles to be replaced with a legal long-acting, safe, and orally administered substance" (379). Consequently, methadone "frees the abuser from the vicious cycle of always chasing a 'fix' and from vacillating between being sick and being high" (167). Both the individual and society can benefit substantially from this substitution, with benefits continuing to occur as long as the patient is in treatment.

Because of drug abuse's chronic relapsing nature, methadone is frequently compared to insulin therapy for diabetes and to anti-hypertensive treatments (224,238,258). This analogy is relevant because it not only increases understanding of methadone's role, but also helps to clarify the way that methadone should be evaluated. Both hypertension and insulin-dependent diabetes can be controlled by appropriate medication. Although some patients may be able to discontinue insulin or anti-hypertensive treatment at some point, others, probably the majority, will continue indefinitely on adequate doses of medication to control their disorders. Accordingly, the effectiveness of their prescribed medications is assessed while the patient is still in treatment, by measuring blood sugar or blood pressure. Even with these treatments, however, not all patients show the same response to treatment, which can be more or less successful for certain patients.

The second distinction, between methadone's efficacy and effectiveness, also entails important policy implications. The concepts of efficacy and effectiveness stem from randomized clinical trial research.[4] The efficacy of treatment refers to the observed results of experimental research done under ideal conditions and circumstances. When an efficacious treatment is implemented in the real world, the magnitude of the effect may differ due to

[4]Efficacy is the probability of benefit to individuals in a defined population from an intervention applied for a given problem under ideal conditions of use. Effectiveness, on the other hand, is the probability of benefit to individuals in a defined population from an intervention applied for a given problem under average or actual conditions of use.

contamination from other real life parameters and inappropriate implementation. This is especially true for methadone maintenance, whose effectiveness has been said to vary from 40 to 98 percent (21,299). It is conceivable that this variability may partially be attributed to different population characteristics. The evidence, however, points to non-client related variables. Ball's study found that differential effectiveness was related both to length of a patient's stay and the quality of provided treatment.

Even an ideal methadone maintenance program has two distinct yet interrelated components. One is the administration of the pharmacologic substance, and the other is the variety of ancillary services that are offered. Methadone is a synthetic opiate with a very clear pharmacologic role: to bind to the opiate receptors, reduce drug craving, and inhibit the occurrence of the painful opiate withdrawal syndrome. On the other hand, biological and psychosocial vulnerabilities make drug abuse a multi-dimensional disorder. Drug abuse occurs in people who enter treatment with a variety of other problems (e.g., existing psychiatric and non-psychiatric illnesses and family, financial, employment, and legal difficulties). Ancillary services are intended to address these problems. The goals of methadone maintenance treatment vary from decreasing illicit opiate use (as a direct effect of methadone's action) and related criminal activity to increasing employment, social integration, and the quality of life. The extent of a program's success depends also on other program and staff-related variables, patient-related variables, and societally influenced factors beyond methadone's influence.

Ample evidence testifies to the high success rates of the whole package of methadone maintenance treatment. With regard to specific treatment components, evidence about the importance of adequate dosage is particularly strong. Experimental studies are needed, however, to examine the interaction of methadone dose with other non-pharmacological treatment elements, such as take-home policies; frequency of urine testing;, the availability, type, and intensity of support services, and human factors, from program management to staff's attitudes and qualifications. Random assignment of drug abusers to different treatment plans within the same modality seems to be more practical than random assignment to different modalities (59).

The great variation in success rates suggests that somewhere in the implementation process, effectiveness may have been compromised. More than 700 methadone maintenance programs operate in the United States, with great variability in their policies (13,21,187,299). Foe example, a 1989 survey by the U.S. General Accounting Office of 24 methadone maintenance programs revealed that daily average dosage levels ranged between 21 to 67 mg (299). At 21 of the 24, the average dose was below 60 mg per day, which according to C. Schuster, the NIDA Director, "more studies have found to be the lowest effective dose" (257). Counselor-to-patient ratios ranged from 1:15 to 1:96. Less than one third of the programs surveyed provided on-site educational and vocational services (6 and 4, respectively), and only one program had separate aftercare services. At the same time, continued heroin use by the patients ranged from 2 to 47 percent.

These results suggest that in many programs methadone maintenance does not reach its potential. This finding also begs the question of whether scientific evidence guides the operation of these programs. Research findings have produced strong evidence of the importance of adequate methadone dosage in reducing opiate use. Although increasing treatment slots and improving the quality of the existing services are important steps in the battle against opiate abuse, flexible dosage policies have the potential to rapidly improve the effectiveness of methadone maintenance. Administering a sufficiently high dose for methadone to achieve effectiveness assumes particular importance in light of the HIV epidemic.

Other Pharmacological Agents

Medications can have a substantial effect on the treatment of drug abuse. Medications can be administered easily and can complement other medications, behavior modification, or psychotherapy. Moreover, they may provide opportunities to intervene in various stages of the recovery process in order to prevent relapse.

Naltrexone

Naltrexone blocks the effects of heroin by binding to the narcotic receptors, but does not produce euphoric effects and is not addictive (see ch. 3). Naltrexone can be used as a short-term blockade agent during the transition from drug use to abstinence, as an occasional blockade agent for high-risk relapse situations, or as a long-term maintenance agent to protect against relapse.

In contrast to its efficacy, its effectiveness may be more limited. Although naltrexone is an efficacious pharmacological agent and has been observed to decrease opiate use and reduce drug craving, it has not been well accepted by heroin abusers (123,168). In practice, high dropout rates occur, especially during the induction period; 40 percent of patients often discontinue treatment by the end of the first month (168). This phenomenon may result partly from naltrexone's producing opiate withdrawal if the client has used heroin within the last 3 to 7 days (35). Depending on the type of patient and the level of support, average retention rates range from 1 to 6 months or longer (168). Higher retention rates have been found for health professionals and business executives, for whom success rates as high as 75 percent have been reported (168). The common denominator of success appears to be a highly motivated patient with family support. Strategies to improve compliance with naltrexone, such as individual and group counseling, family therapy, and contingency contracting, are discussed in more detail in a review by Kosten and Kleber (180).

To realize naltrexone's potential, further efforts are needed to "demonstrate the range of patients for which the drug is best suited, and the setting and supportive approaches that should be administered" (168). Another promising option for enhancing naltrexone's effectiveness is the current development of its administration in a depot form (i.e., skin implants that gradually release the drug into the bloodstream) (238). Such an approach might extend the drug's action and require less frequent administration.

Levo-Alpha-Acetyl-Methadol (LAAM)

Like methadone, LAAM is a narcotic agonist intended to occupy the narcotic receptors, prevent withdrawal symptoms, and block heroin effects. The main difference between the two drugs is that LAAM is longer acting and can be administered just 3 times a week instead of daily, thus reducing the need for take-home methadone and the likelihood of diversion (121). NIDA has recently awarded a contract to Biometrics Research Institute to sponsor LAAM to the Food and Drug Administration for marketing approval (see ch.3) (35). Patient acceptance of programs administering LAAM and retention rates (varying from 17 to 77 percent), however, are a problem. Abuse patterns, possible metabolic differences, and patient lifestyles and treatment expectations (e.g., some clients may need daily contact with the clinic, while others may find it annoying and disruptive) may play a role in overall effectiveness (121,164,290). Thus, methadone and LAAM may not be equivalent interventions for all heroin abusers. This reality underscores the importance of further research to identify those patients for whom each agent is more appropriate and to match them accordingly.

Pharmacotherapies for Cocaine Abuse

Several medications under development or in the early stages of testing may assist the treatment of cocaine abuse. In fact, the latter category includes certain drugs already used to treat other disorders, especially depression.

The potentially useful drugs for cocaine abuse are employed to ameliorate cocaine-associated anhedonia, depression, or craving. Some clinical studies have found that certain currently used antidepressants decrease cocaine craving and depression, thus facilitating the abstinence process. The most promising drugs so far are the tricyclic antidepressants desipramine and imipramine (114,115,117). Another drug that may reduce withdrawal distress and craving is bromocryptine, a drug used to treat Parkinson's disease (106). Bromocriptine works faster than desipramine, but wears off more quickly. This pattern suggests that bromocryptine may be more effective in the early phases of withdrawal, while desipramine may be more helpful in the later stages of cocaine abstinence (106).

Although initial results are promising, thorough scientific evaluations, with randomized placebo-controlled double blind studies and longer followup

times, are necessary to establish efficacy and to identify groups that are most likely to benefit.

Combined Therapy for Heroin and Cocaine Abuse

A potentially helpful drug for treating the dual abuse of heroin and cocaine is buprenorphine (see ch. 3). This drug is a partial opiate agonist, that is, it has a diminished opiate effect compared with full agonists, such as methadone. Its slow onset entails a minimal risk of overdose and minimal withdrawal (35). It produces a generalized feeling of contentment and has been used effectively to detoxify heroin abusers (181,259). In addition, buprenorphine has the potential to facilitate the transition from opiate abuse to drug-free status, naltrexone, or methadone maintenance (310). During clinical studies, buprenorphine seemed to decrease cocaine use among opiate users (181). Results from another study of daily administration of buprenorphine to rhesus monkeys that were self-administering cocaine showed that cocaine use was suppressed during the daily administration of buprenorphine (211).

Summary of the Effectiveness of Other Pharmacotherapies

Despite the potential that pharmacotherapies other than methadone hold for drug abuse treatment, their promise has not fully materialized. Further research is needed to show how these pharmacotherapies can be used in appropriate ways as adjunct to longer term treatment. Many of these promising medications are currently undergoing controlled clinical trials. It is imperative that evaluations be conducted to establish not only their efficacy but also their effectiveness in actual treatment environments.

Therapeutic Communities (TCs)

Transmission of HIV infection is not confined to IV heroin use. Sharing of injection equipment regardless of the choice of drug (heroin, cocaine, amphetamine) and crack-related high-risk sexual behaviors all relate to HIV spread. Treatment in TCs does not target specific drugs of abuse; rather it aims at a complete behavior change and a drug-free lifestyle. Thus, TCs have the potential to contribute to efforts to prevent HIV infection among the populations they serve.

Information on the effectiveness of TCs comes primarily from two national evaluation studies (DARP and TOPS) and program-specific evaluations conducted mainly by De Leon (76). This section presents separately the findings for each study. All the evaluations reviewed here involve TCs with planned durations of stay exceeding 12 months.

Program-Specific Studies

In the early 1970s, a series of evaluation studies were conducted at Phoenix House, the largest TC in the country. Two cohorts, one admitted in 1970-71 and the other in 1974, were followed to examine treatment effectiveness. The majority, 85 percent, of the admitted population of the 1970-71 cohort were heroin abusers, while 53 percent of the 1974 cohort abused heroin. These proportions reflect the predominance of heroin as the primary drug of abuse during the 1970s and the changing patterns of drug use in the middle of the decade. The early cohort was followed for 5 to 7 years, and the second cohort (1974) was followed for 2 years. Followup rates of the original samples were 80 percent (76,80). The outcome measure was absolute success throughout the years of followup (not at year of followup like other studies), defined as self-reported achievement of total abstinence from drugs and no criminal activity, a rather stringent criterion.

Tables 4-5 and 4-6 present the findings for program graduates and dropouts, respectively, according to the type of drug and time spent in treatment. After two years of followup, 95 percent of the 1970 cohort and 90 percent of the 1974 cohort program graduates were abstinent from opiates and had no involvement with criminal activity. When

Table 4-5--Percent Success Among Program Graduates, Phoenix House

Cohort	Years to followup	Percent success[a] Opiates	All drugs
1970	2	95	89
	5-7 (mean = 6.4)	79	75
1974	2	90	68

[a]Defined as self-reported achievement of total abstinence from drugs and no criminal activity. The traditional period of TC treatments is 18 to 24 months.

SOURCE: De Leon (76); De Leon and Jainchill (82); and De Leon, Wexler, and Jainchill (84).

Table 4-6--Percent Success[a] Among Program Dropouts, Phoenix House

Cohort	Years to followup	Months in treatment < 12	Months in treatment ≥12
1970	3-6 (mean = 4.7)	17	42
1974	2	25	52

[a]Defined as self-reported achievement of total abstinence from drugs and no criminal acctivity.

SOURCE: De Leon (76); De Leon and Jainchill (82); De Leon, Wexler, and Jainchill (84).

non-opiate drugs are taken into account, 89 percent of the 1970 cohort and 68 percent of the 1974 cohort were successes. After a mean of 6.4 years of followup of the 1970 cohort graduates, the success rate for those whose primary drug of abuse was heroin, was 79 percent, while it was 75 percent from all graduates regardless of the primary drug of abuse. The results for those who did not complete treatment (dropouts) according to the time they spent in treatment are shown in table 4-6. The mean followup time was 4.7 years for the 1970 cohort dropouts and 2 years for the 1974 cohort dropouts. For the earlier cohort, the success rate at followup for those who remained in treatment fewer than 12 months was 16 percent, compared with 42 percent for those in treatment at least 12 months. Similarly, of the 1974 cohort 25 percent who spent fewer than 12 months in treatment v. 52 percent of those who spent at least 12 months in treatment remained successful 2 years after dropping out of the program. Multiple regression analysis of the data found that time in treatment was the most significant predictor of success (76,77,79,84,89).

DeLeon also conducted an extensive review of the literature on the effectiveness of TCs. The review examined studies that varied considerably in study design, sample size, length of followup, and degree of sophistication in the data analysis (75). DeLeon concluded that all studies showed consistent findings with regard to treatment effectiveness. Drug use and criminal behavior decreased, while social functioning (employment or school involvement) increased. Consistent results pointed towards significant improvements on most psychological scales during treatment and followup. Self-esteem, ego strength, socialization, and depression scores all improved, although they did not reach normal, healthy levels (75,78). Furthermore, those studies that compared program graduates with program dropouts found significant positive differences on all outcomes for those completing the planned duration of treatment.

DARP Study

The reported findings from this large-scale national evaluation pertain to white and black males only. It should also be noted that these outcomes pertain to *all clients who were admitted* to treatment regardless of the length of time they spent in treatment. The outcome measure was daily opiate use and is reported for the 2 months before entering treatment and during the first and third year post-treatment. Table 4-7 presents the findings. Although the prevalence of daily opiate use was 100 percent before treatment in TCs, it dropped to 39 percent during the first year after treatment and dropped further to 26 percent during the third year post-treatment. The prevalence of any lifetime arrest

Table 4-7--Percent Self-Reported Opiate Use, Criminal Activity, and Employment by Males[a] in Therapeutic Communities, DARP

Category	Pre-treatment period[b]	During 1 year after treatment[c]	During 3 years after treatment[c]
Daily opiate use	100	39	26
Arrest	95	33	23
Incarceration	62	33	32
Employment half-time or more	20	61	68

[a]Statistics refer only to white and black males.
[b]The pre-treatment periods varied: 2 months for opiate use, lifetime for arrest and incarceration, and previous 12 months for employment.
[c]Average followup rates were 79 percent for cohorts admitted from 1969 to 1971 and from 1971 to 1972 and 69 percent for the cohort admitted in 1973 to 1974.

SOURCE: Simpson and Sells (272).

or incarceration was 95 percent and 62 percent, respectively, among clients entering treatment. These arrest and incarceration rates were reduced to 23 and 32 percent, respectively, during the third year after treatment. The rate of incarceration was higher than the rate of any lifetime arrest during the third year. This may be a reflection of no new arrests for some abusers during that year, at the same time that some may have been in jail serving time from arrests in previous years. The proportion of clients who were employed half-time or more at baseline (previous 12 months) was 20 percent. During the third year after treatment the proportion more than tripled to 68 percent (272).

TOPS Study

Drug Use--The results for drug use are reported separately for heroin and cocaine (see table 4-8). These results pertain to those who stayed in treatment at least 3 months. By the end of the third month, however, 56 percent of the TC clients discontinued treatment. The median time spent in treatment of the total TC sample was 11 weeks (147,149,150). The findings from those who remained fewer than 3 months are similar with respect to heroin use to those who stayed 3 months or more. With regard to cocaine use and criminal activity, however, those who spent fewer than 3 months had worse results than those who remained more than 3 months (149).

One year before treatment, the prevalence among TC clients of heroin use was 30.9 percent and cocaine use was 27.6 percent. After 3 to 5 years of followup, the numbers of regular heroin and cocaine users (weekly or daily use) decreased about two thirds to a prevalence of 11.8 and 9.6 percent, respectively. These improvements are also reflected in the 1-year abstinence rate. Of those using heroin 1-year prior to treatment, more than 50 percent ceased using it the year after treatment; the equivalent figure for cocaine was 47 percent. The overall improvement rate (those who either stopped or decreased use during the year after treatment) for those who remained in treatment for at least 3 months was 70 percent for heroin and 68 percent for cocaine.

Criminal Activity--More than half of the residential clients of TCs (60 percent) were involved in some kind of criminal activity in the year prior to treatment (table 4-8). This proportion plummeted to 3.1 percent while in treatment, increased gradually to 28.9 percent at 1 year after treatment, and dropped again to 19.8 percent at the 3- to 5-year followup. Of those who engaged in criminal activity during the year prior to treatment, 75 percent had not been involved in criminal activity during the year after treatment.

Employment--Only a small proportion (15.3 percent) of the clients entering residential TC treatment were employed full-time the year before entry (table 4-8). The proportion of full-time employed clients more than doubled immediately after treatment, and although it fluctuated subsequently, it stabilized at 38.7 percent at the 3- to 5-year followup (approximately 2.5 times higher than originally).

Table 4-8--Percent Self-Reported Drug Use, Criminal Activity, and Employment by Therapeutic Community Clients Treated at Least 3 Months, TOPS[a]

Category	Year before treatment	3 months in treatment	3-month followup	1-year followup	2-year followup	3-5 year followup
Regular heroin use[b]	30.9	0.3	10.7	11.5	13.2	11.8
Regular cocaine use[b]	27.6	0.1	12.9	15.5	8.0	9.6
Serious predatory crime	60.9	3.1	25.2	28.9	24.0	19.8
Full-time employment	15.3	2.2	35.8	27.7	20.9	38.7

ABBREVIATION: NA = not available

[a]No statistics on followup rates for clients treated at least 3 months were presented. For all those in therapeutic communities, regardless of the duration of treatment, followup rates ranged from 81 percent for 3-months followup to 65 percent for 3-5 year followup.
[b]Weekly or more frequent use.

SOURCE: Hubbard, Maraden, Rachal, et al. (149).

Time in Treatment and Outcome--Several studies that examined "time-in program" factors have been reviewed by DeLeon and Anglin (13,75,77). Although the magnitude of the effect of time in treatment varied across studies, few studies failed to demonstrate a positive effect. The authors concluded that time spent in treatment was the most powerful predictor of a favorable outcome (13,77,82). It should be noted, however, that establishing the causal link between time in treatment and treatment effectiveness is methodologically a formidable task. Factors external to treatment that influence the natural history, such as self-selection and motivation, can confound the results by contributing to observed outcomes.

One of the more methodologically sound studies that attempted to overcome these limitations was conducted by Holland in 1983 (144). The study sample consisted of 400 former residents of Gateway House, a TC in Illinois with a planned duration of treatment of 2 years. Three admission cohorts were included according to the year of first admission to the facility (1968-1970, 1970-1972, and 1972-1974). The subjects were further classified into four groups according to the time spent in the program (fewer than 3 months, fewer than 9 months, more than 9 months but not treatment completion, and graduation from treatment). To measure treatment effectiveness, composite indexes were constructed for the following outcome measures: drug use, alcohol use, criminality, employment, and social stability. Data analysis was performed in two stages. The initial analysis examined changes in the outcome criteria between baseline and followup. Post-treatment improvements in all areas except alcohol use were observed for all four groups. The degree of improvement increased with increasing time in treatment. In the second stage, the investigator attempted to evaluate alternative hypotheses that could have explained the observed treatment effects. Multiple regression analyses and time-series analysis examined the validity of several rival hypotheses: an interaction between maturation and selection; differences in time between discharge and followup among the four groups; differential followup completion rates for the above groups, and differential validity of the self-reported data. The conclusion of the study was that, "data probes revealed that, in general, time in program was the single best predictor of post-treatment outcome and that the data failed to support the rival hypotheses" (144).

Data from the TOPS study were also analyzed through multivariate regression analysis to examine factors associated with the observed outcomes and behaviors. These independent variables consisted of sociodemographic measures, prior treatment episodes, sources of referral, pre-treatment drug abuse patterns, treatment durations, and subsequent treatments. The analysis of these data (shown in table 4-9 supports the conclusion that for heroin abusers, time spent in treatment was the primary factor associated with treatment effectiveness.

Table 4-9--Odds Ratios for Post-Treatment Outcomes in the First Year After Residential Treatment, by Treatment Duration, TOPS

	Time spent in treatment[a]				
Outcome	Comparison group 1-13 weeks n = 60	14-26 weeks n = 325	< 1 week n = 137	27-53 weeks n = 95	> 52 weeks n = 114
Regular heroin use[b]	1.00	0.69	0.43	0.52	0.28[c]
Regular cocaine[b]	1.00	0.98	1.04	0.85	0.38
Predatory crimes	1.00	1.07	0.61	0.43[c]	0.29[d]
Full-time employment	1.00	0.57	0.87	0.90	2.65[e]

[a]Self reports from 731 of the 1,282 clients who were sampled for followup.
[b]Weekly or more frequent use.
[c]$p < .05$
[d]$p < .001$
[e]$p < .01$

SOURCE: Hubbard, Marsden, Rachal, et al. (149).

Overall, positive results were more likely to be achieved by those who remained in treatment for more than 52 weeks. Clients who spent more than 52 weeks in treatment compared with those who left prematurely within the first week were 72 percent less likely to use heroin, 70 percent less likely to be involved in criminal activity, and 165 percent more likely to be fully employed. Although they were also 60 percent less likely to use cocaine, this difference did not reach statistical significance (149).

Dropout Rates--Although people treated in TCs have successfully achieved a variety of positive outcomes in addition to reducing drug use, their overall impact is severely impaired by their limited ability to keep clients in treatment, either for the whole planned duration or for a time sufficient for treatment to exert some positive influence. Research shows that clients leave treatment prematurely for both personal and program-related reasons (79). This difficulty retaining clients is certainly related to the rigorous, demanding, confining, and confrontational nature of treatment in the TC environment.

There is a consistent temporal pattern of dropping out of TCs. A compilation of studies showed that the sharpest dropout rate occurs during the first 30 days after admission, during which 35 to 50 percent leave. The dropout rate continues to increase further, so that by the end of the third month into treatment, the cumulative dropout rate ranges from 50 to 70 percent. Thereafter, the rate of leaving treatment slows. The retention at 1 year is between 15 and 25 percent, and actual completion rates range from 10 to 15 percent. Recent reports indicate that there was an improvement in retention rates in the latter part of the 1980s (79). Although it is hard to identify the exact reasons for such an improvement, it is speculated that the improvement may be partially attributed to client characteristics (e.g., an aging opiate-users cohort, fear of relapsing into cocaine and crack abuse) and improved staff training (79).

Predictors of Retention--Research on predicting retention and identifying client attributes that influence retention in TCs has not been particularly informative, with a few possible exceptions (75,79). A distinct client profile does not seem to exist; however, client variables such as severe criminality and psychopathology do appear to be negatively associated with retention. Factors such as personal motivation (intrinsic pressure), readiness (one's perceived need for assistance to change), and suitability (the appropriateness of the client-treatment match) may influence the decision not only to enter but also to remain in treatment as well (156). Data from TOPS indicated that older clients, those who were not married at the time of treatment, those who were not depressed at entry into treatment, and those who were referred by the criminal justice system were more likely to remain longer in treatment (149) In addition to the influence of client characteristics on retention, it has been suggested that program parameters related to quality (e.g., staff composition, experience, and administration) might play a role, but these factors have not been fully evaluated. De Leon noted that although there are limitations in prediction studies, "Psychological, motivational, perceptual and other 'dynamic' variables appear more relevant to retention, than do 'fixed' variables such as demography, drug use pattern, and family background" (79). An ongoing NIDA-funded study, which uses an experimental design to examine the effect of three interventions on modifying early dropout from a TC, has shown some encouraging results (79).

Summary of TC Effectiveness

The substantial improvements among drug abusers who continue in TCs and the persistence of these changes years after treatment are consistent with TCs' effectively reducing drug use, at least among those who commit themselves to complete the whole course of treatment. It is noteworthy, however, that, a sizable minority of dropouts, 30 to 35 percent, also appear to be successful during the followup period (76). Of all those admitted to treatment, regardless of time in treatment, 30 percent achieved absolute success (no drugs, no crime), with improvement rates ranging from 50 to 60 percent (76,81). Success rates do not vary considerably (no more than 15 percent variation) among specific programs (80). In judging these results, one should keep in mind that the program-specific evaluations probably were performed in the more research-oriented programs that had the drive and

capability to evaluate themselves. Program-specific results might therefore show higher effectiveness rates than would those present in the average TC facility. On the other hand, results from the national studies are averages over several programs that may also include some shorter term or modified residential programs (149). These results may therefore dilute the effectiveness of the more traditional, homogeneous, and higher quality programs.

It should be noted that these high success rates were observed among abusers who completed treatment in TCs. Although real improvements are also seen among clients who spent some time in treatment but left prematurely, the self-selection of clients remaining in treatment may directly influence the direction and the size of the observed beneficial effect of treatment (242). It should be further noted that the likely cumulative effect of time in treatment relates mostly to heroin use.

It is indeed a severe limitation of the TCs that only a small minority of their clients remain in treatment long enough to realize the associated benefits (10 to 15 percent of those admitted). Whether these highly motivated individuals would attain the same improvements in the absence of the specific intervention is unclear. It should also be noted that TOPS data showed that TC residents were characterized by greater problem severity among many dimensions, including more involvement with multiple drug abuse (149). These factors may influence retention and contribute to high drop-out rates.

Factors that influence retention other than client characteristics (e.g., treatment environment variables) should also be identified. Efforts should be made to identify those patients for whom this structured residential program would be most beneficial. Increasing retention rates in TCs might play a significant role in reducing the use of drugs and associated crimes.

Finally, although the effectiveness of the traditional TCs has been evaluated, the same cannot be said for the shorter-term residential programs. As yet no studies have evaluated the effectiveness of the 21-day, 30-day, or 6-month residential programs.

Outpatient Drug-Free (ODF) Programs

Data regarding the effectiveness of outpatient drug-free (ODF) programs are sparse and stem primarily from the two large-scale national multi-modality studies (DARP and TOPS) that included ODFs in their evaluations. It should be kept in mind that the reported effectiveness of ODFs pertains to an amalgam of centers, a diverse collection of programs with little uniformity, whose common denominator is their drug-free philosophy and outpatient nature. As mentioned in chapter 3, ODFs usually provide some or all of the following services: counseling, therapy, education, ancillary services, and a 12-step program. These services are not dependent on the type of drug of abuse.

DARP Study

Pre-treatment and 1- and 3-year post-treatment outcomes for opiate addicts with respect to daily opiate use, employment, and criminality of ODF clients are presented in table 4-10. These findings

Table 4-10--Percent Self-Reported Opiate Use, Criminal Activity, and Employment by Males[a] in Outpatient Drug-Free Treatment, DARP

Category	Pre-treatment period[b]	During 1 year after treatment[c]	During 3 years after treatment[c]
Daily opiate use	100	44	28
Arrest	87	34	22
Incarceration	51	34	36
Employment half-time or more	24	52	66

[a]Statistics refer only to white and black males.
[b]The pre-treatment periods varied: 2 months for opiate use, lifetime for arrest and incarceration, and previous 12 months for employment.
[c]Average followup rates were 77 percent for cohorts admitted to treatment from 1969 to 1971 and from 1971 to 1972 and 70 percent for the cohort admitted from 1973 to 1974.

SOURCE: Simpson and Sells (272).

pertain to white and black males only and refer to all clients admitted to treatment. Daily opiate use declined from 100 percent prior to treatment to 44 and 28 percent 1 and 3 years after treatment, respectively. The proportion of those who were employed half-time or more rose from 24 percent at baseline to 53 percent during the third year after treatment. Both measures of criminality also improved: any arrest declined from 87 percent to 22 percent during the third year post-treatment, and any incarceration dropped from 62 to 32 percent at the same time interval (272).

TOPS Study

Table 4-11 shows the TOPS findings relating to ODF programs with respect to drug use, criminality, and employment. These findings refer to those who spent at least 3 months in treatment (149). By the third month, nearly 64 percent of the clients had either dropped out, transferred, or completed treatment; the median time spent in treatment for the total ODF sample was 7.9 weeks (149,150). For people who spent fewer than 3 months in treatment, the magnitude of the observed improvement in all three outcome measures was smaller than the improvement observed among those who remained in treatment more than 3 months.

Drug Use--The prevalence of heroin and cocaine users among ODF clients was small; however, within this group both heroin and cocaine use decreased. Among those who entered ODF programs, 8.6 percent used heroin and 12.8 percent used cocaine regularly (weekly or more frequently) the year before (the majority of clients were using marijuana and prescription drugs) (149). The prevalence of regular users of both drugs declined by half at the 3- to 5-year followup to 4.6 and 5.6 percent, respectively, for heroin and cocaine. Because of the relatively small numbers of heroin users, abstinence and improvement rates could not be calculated. Measurement of abstinence and improvement rates were possible for cocaine users who remained in treatment at least 3 months. Of those who used cocaine regularly during the year before treatment and who stayed in treatment at least 3 months, 42 percent ceased use the year following treatment (abstinence rate), and a total of 77 percent either stopped use completely or decreased it during the year after treatment (improvement rate).

Criminal Activity and Employment--During the year preceding treatment, 33.5 percent of ODF clients were involved in a predatory illegal act (149). This proportion declined to 7.6 percent at the 3- to 5-year followup. Similar improvement was observed among ODF clients with respect to full-time employment. Although 27.1 percent were fully employed 1 year before treatment, almost twice as many (49.7 percent) were fully employed 3 to 5 years after treatment. These improvements are reflected in the abstinence rate for illegal activity (for those who spent at least 3 months in treatment). Almost two-thirds of the clients reporting illegal acts the year prior to treatment had eliminated their criminal involvement the year after treatment. Similarly, more than one-third (35 percent) of those who were not fully employed the year before treatment had engaged in more weeks of full-time employment in the year after treatment.

Table 4-11--Percent Self-Reported Drug Use, Criminal Activity, and Employment by Outpatient Drug-Free Clients Treated at Least 3 Months, TOPS[a]

Category	Year before treatment	3 months in treatment	3-month followup	1-year followup	2-year followup	3-5 year followup
Regular heroin use[b]	8.6	3.0	5.1	4.9	4.9	4.6
Regular cocaine use[b]	12.8	3.5	9.0	8.1	2.9	5.6
Serious predatory crimes	33.5	9.4	11.0	18.7	14.5	7.6
Full-time employment	27.1	36.0	38.2	38.5	39.4	49.7

ABBREVIATION: NA = not available

[a]No statistics on followup rates for clients treated at least 3 months were presented. For all those in outpatient drug free programs, regardless of the duration of treatment, followup rates ranged from 84 percent for 3-month followup to 65 percent for 3-5 year followup.
[b]Weekly or more frequent use.

SOURCE: Hubbarrd, Marsden, Rachal, et al. (149).

Dropout Rates--Although perhaps to a lesser degree, outpatient drug-free programs suffer from the same drawback as TCs, namely a limited ability to retain clients in the program for the planned duration of treatment. The TOPS data showed that within a week or less, 21 percent, and by the end of the first month, 36 percent had dropped out (147,149,150). By 3 months, approximately 64 percent of the clients had either dropped out, transferred, or completed ODF treatment. Overall, longer stays of treatment were related to factors such as older age, female sex, education beyond high school, criminal justice referrals, and no heavy alcohol use (149,150).

Treatment Duration and Outcome--A multivariate analysis of the TOPS data examined the effect of treatment duration on various outcome measures (table 4-12). In contrast with the other modalities, the analysis indicated that length of treatment was a statistically significant predictor of both criminal activity and full-time employment, but not of heroin or cocaine reduction (149). Those who stayed in the program more than 26 weeks were half as likely to be involved in illegal activity, and almost twice as likely to be fully employed than those with less than 1-week attendance. Client population characteristics (better educated, most likely to be first treatment episode) or the absence of a real length of treatment effect may account for the observed lack of an association between time in treatment and lower heroin and cocaine use.

Summary of ODF Effectiveness

Interpretation of treatment results of the ODF programs is hampered by the lack of uniformity among ODF programs. Based on the DARP evidence, Anglin and Hser in their review stated that although the ODF modality appeared to be as effective as the other modalities, the number of clients served was usually small, and the most favorable outcomes were observed among those clients who used opiates less than daily, usually together with other drugs, or who used only nonopiates (13). The more recent TOPS data suggest lower drug use and other favorable outcomes for the drug users treated in this modality. However, direct comparison with the other modalities may not be appropriate because of the self-selection of patients to each modality and the subsequent differences among the client populations. The investigators suggest that clients attracted to ODF treatment are people with less severe problems and better societal functioning who may be more amenable to change (149). Positive outcomes for those who remained in treatment for at least 3 months were reflected in the improvement rate for cocaine (77 percent of regular users in the year before treatment who ceased or reduced drug use the year after treatment) and the levels of employment (a doubling of the pretreatment proportion at the 3- to 5-year followup) (149).

Although the drug use, criminal activity, and social productivity, of those in ODF programs improve at least for the specific and selective client

Table 4-12--Odds Ratios for Post-Treatment Outcomes in the First Year After Outpatient Drug-Free Treatment, by Treatment Duration, TOPS

	Time spent in treatment[a]			
Outcome	Comparison group < 1 week n = 183	1-13 weeks n = 344	14-26 weeks n = 165	> 26 weeks n = 162
Regular heroin use	1.00	1.03	1.43	0.35
Regular cocaine	1.00	1.14	1.15	0.76
Predatory crimes	1.00	0.73	0.63[c]	0.47[d]
Full-time employment	1.00	0.90	1.35	1.95[c]

[a]Self reports from 854 to 1,449 clients who were sampled for followup.
[b]Weekly or more frequent use.
[c]$p < .05$
[d]$p < .01$

SOURCE: Hubbard, Marsden, Rachal, et al. (149).

population they serve, more needs to be learned with respect to the diversity among ODF programs and their clients. Furthermore, because studies of ODF programs, unlike those of methadone maintenance and TCs, have not documented treatment content, conclusions about ODFs may be more tentative.

Organizational and structural elements that may contribute to treatment effectiveness are not clearly known. To this end, program-specific research that takes into account program content may shed light on ODF effectiveness. This knowledge, while currently limited, is of extreme importance because of the potential that outpatient programs hold for a more cost-effective provision of drug abuse treatment.

Results Combining Treatment Modalities

Some studies report overall treatment effectiveness without distinguishing among treatment modalities. These studies are summarized below.

In a carefully designed prospective study, McLellan and colleagues examined the effect of substance abuse treatment on several outcomes, including alcohol and drug use and the use of medical, legal, employment, family, and psychiatric support services (209). They compared a group of 225 mostly heroin abusers with a comparable group of 57 abusers who received fewer than 15 days of treatment. The followup time was 6 months. Admission and followup data were based on the addiction severity index, a standardized instrument based on self-reported data from a 30- to 40- minute clinical interview. This useful diagnostic tool, whose reliability and validity have been demonstrated, measures problem severity in six areas (i.e., medical, legal, employment, family, psychological, and substance abuse) and yields a 10-point rating of the above dimensions (208). The treatment programs included a methadone maintenance clinic, a short-term 45-day intensive therapy group based on Narcotics Anonymous principles, and a 60-day drug abuse rehabilitative program offering a variety of ancillary services. Assignment to a program was based on a combination of personal preference, clinical judgment, and chance. Overall, 13 percent of the drug abusers dropped out of treatment, but the dropout rates did not differ significantly among the various programs (209).

The investigators stated that the observed positive findings pertained to all of the above programs. The results for the treated group suggested major improvements in most areas, notably a decrease in the average days of opiate use (in the past 30 days) from 13 to 3 days and increased employment days (in the past 30 days) from 3 to 10 at the time of the 6-month followup. In addition, the comparison of the two samples revealed significantly better post-treatment outcomes and larger treatment effects across all seven outcome dimensions.

Kosten and his colleagues at the Substance Abuse Treatment Center of the Connecticut Mental Health Center followed 150 opiate abusers for 2.5 years (183). Their facility included inpatient detoxification, methadone maintenance programs, a naltrexone outpatient program, and a therapeutic community program. The patients were assessed at admission and at followup with the addiction severity index. At the 2.5 year followup, significant improvements had occurred in drug use and legal and psychological problems. At admission, the mean days of opiate use were 23.7 in the last 30 days, which after 2.5 years dropped to 4.9 days, a statistically significant difference. Likewise, the mean number of crime days declined from 14 to 3.8, and the mean number of anxiety days declined from 11.7 to 5.8 (both of the above improvements were statistically significant).

The investigators of the DARP study presented a comprehensive summary across treatment modalities of a 12-year followup of a sub-sample of the stratified random sample of 4,107 patients who were selected for the 6-year followup study (270). This sub-sample comprised 490 patients who were all daily opiate users at the time of admission. Daily opiate use decreased from 100 percent to 28 percent at the 3-year followup and decreased further to 24 percent at the 12-year followup. Although nonopiate use initially declined from 55 percent to 35 percent at the 6-year followup, this trend was reversed to 47 percent at the 12-year followup. Since greater use of cocaine accounted for this increase, clients may have been substituting cocaine for heroin use. Similarly, the employment pattern fluctuated during these years of followup from 36 percent of clients reporting 6 or more months of employment pre-DARP to 61 percent at year 3 and 54 percent at year 12. Finally, criminal involvement, measured as percent with any

arrest, decreased steadily from 87 percent pre-DARP to 22 percent and 13 percent at the 6- and 12-year followups, respectively.

Acupuncture

It has been suggested that acupuncture can serve as an alternative mode of drug abuse treatment (275). Acupuncture for drug abuse treatment involves the insertion of three to five special needles under the surface of the external ear for a period of time, a process that can be performed on an outpatient basis. Proponents of this technique claim that it can control withdrawal symptoms and drug craving and reduce the fears and hostilities that are usually present in traditional drug abuse treatment settings (275).

Advocates view acupuncture as an adjunct treatment during detoxification. It is further considered to be only one component of drug abuse treatment, which includes such activities as daily urine testing, counseling, participation in Narcotics Anonymous, and educational and employment referrals (275).

The efficacy and effectiveness of acupuncture in treating drug abuse, however, have not been established (368). Recently, in 1989, encouraging results were reported from a placebo-controlled study with regard to treatment of alcoholism (43). Eighty subjects described as severe recidivist alcoholics were randomly assigned to a treatment (acupuncture at specified ear points) and a control group (acupuncture at non-specific ear points). Treatment duration was 8 weeks, and followup time was 6 months, with a followup rate of 77.5 percent. Retention and program completion differed significantly between the two groups, with 21 of the 40 patients in the treatment group and only 1 of the 40 in the control group completing treatment. At the 6-month followup, control patients had more than twice the number of drinking episodes and admissions to a detoxification center.

Additional research is needed to provide conclusive evidence about the short- and long-term effectiveness of acupuncture in treating drug abuse. Randomized controlled studies seem to be a feasible option in the evaluation of this technique. Furthermore, studies could be done on a blinded basis, since a sham acupuncture process can be used as a placebo, while all drug abuse clients receive the other treatment elements.

Parameters Related to Treatment Outcome

Almost all of the studies that evaluated treatment effectiveness also examined whether other factors related to clients or programs influenced treatment outcomes. This distinction may overlook possible interaction between these sets of variables. Proving that a certain factor relates to treatment outcome is a very challenging methodological endeavor, even for the most soundly designed studies. Even if there were no interactions among variables, it would be difficult to dissect their contributions due to the lack of a strict experimental setting and procedures. One of the most problematic factors of abuse research is clients' self-selection of treatment modalities, which has a profound potential to confound the findings of any study that does not use random allocation to treatment. Despite these problems, the strength and consistency of the evidence provided and reproduced by a variety of studies, especially those employing prospective designs and sophisticated analysis, may overcome some of these limitations. The following section describes some additional characteristics in addition to those highlighted earlier in the modality-specific research.

Patient Characteristics

A spectrum of individual characteristics may influence treatment outcome. Some characteristics relate to the social environments of abusers (e.g., social support systems). Demographic factors, such as age, gender, ethnicity, and education may also be important. Finally, there are more dynamic characteristics, such as an abuser's motivation, severity of abuse, and psychopathology. Not surprisingly, the former characteristics have been more extensively examined than the latter, since their measurement is more simple and feasible. The evidence thus far, as summarized by Anglin and Hser in their review of treatment effectiveness, is that, "abusers who have a more stable family background, an intact marriage, a job, a history of minimal criminality, less evidence of alcohol or polydrug use, and less severe psychiatric disorders are more likely to achieve a better outcome

in most programs (13)." Thus, this circularity resembles the "rich get richer, and the poor get poorer" phenomenon; the attributes of a better outcome may be the same factors that influence the decision to seek and remain in treatment in the first place. The real challenge for drug abuse treatment is to achieve or improve success with the "poorer" clients as well.

Program Characteristics

In the same review, Anglin and Hser state that certain program elements (e.g., psychotherapy, urine testing, legal coercion, and program policies and staffing), when implemented appropriately, have been found to exert a beneficial effect (13).

Psychotherapy addresses the "broader range of psychiatric symptoms that are prominent among drug abusers" (234). The majority of evidence suggests that psychotherapy may be related to improved outcomes for selected groups of abusers. It appears that especially for abusers with moderate to severe psychiatric problems, psychotherapy has the potential to improve treatment outcomes (234,377).

Monitoring illicit drug use while in treatment through urine testing is a common practice. The existing evidence suggests that urine testing alone does not improve treatment outcome; however, there is evidence that linking urine testing results with positive or negative contingencies does influence treatment outcome (13,285).

With regard to whether those who enter treatment under some form of legal coercion tend to benefit from treatment, the reviewers note that the majority of the findings, especially from the better designed studies, "generally support the idea that a collaborative relationship between the Criminal Justice System (CJS) and community treatment delivery systems produces, at an aggregate level, enhanced treatment outcomes" (13). In other words, the results tend to be at least comparable to outcomes produced from those who enter treatment voluntarily.

Matching

A major area that holds promise for increased treatment effectiveness and efficiency is matching individual clients to specific treatment and treatment components according to their needs. Two related and well designed studies conducted by researchers at the VA Medical Center in Philadelphia and the Department of Psychiatry of the University of Pennsylvania are relevant to this issue.

A retrospective analysis was performed in a 1978 cohort of 282 drug-dependent male veterans treated in the VA treatment network to identify possible program-patient matches that were associated with favorable or unfavorable results (210). Patients were evaluated with the addiction severity index both at admission and at 6-month followup. Initial analysis indicated that a patient's psychiatric severity as estimated at admission was the single best predictor of most outcome measures. Based on this finding, the sample was classified into low, mid, and high psychiatric severity groups, and the data were reanalyzed. Results of the second analysis revealed that the low severity group improved significantly regardless of the modality, while the high-severity group showed poor outcomes regardless of their treatment program. In contrast, specific program factors related to improved outcomes were identified in the group with the mid-level of psychiatric severity. The findings from this retrospective study were then used to develop treatment assignment criteria and were subsequently tested in a prospective study.

The prospective study involved 321 drug-dependent patients, all male veterans who were evaluated at intake with the addiction severity index instrument and were eligible in 1980 for assignment to one of the programs in the VA treatment network (210). These programs included a combined alcoholism-other drug abuse 60-day inpatient treatment program, a 60-day TC, and a methadone maintenance clinic. A matching strategy was devised according to psychiatric severity and severity of other problems, such as medical condition, employment, alcohol use, other drug use, legal status, and family relations. Of all patients entering drug abuse treatment, 48 percent were matched to the program

that was predicted to be the best for them. Reasons for not matching were lack of a treatment slot in the assigned program (27 percent), patients' refusal (13 percent), and assignment errors (7 percent). Matched patients were compared with the mismatched during treatment and 6-month followup. It should be noted that treatment staff were blind to the matching status. Followup information was obtained for 94 percent of the subjects. Outcome criteria included psychiatric adjustment, alcohol use, other drug use, medical condition, employment, legal status, and family relations.

Overall, people in drug abuse treatment improved regardless of the client matching status and type of program. Treated patients showed decreases in both opiate and non-opiate drug use (67 and 50 percent, respectively), a 67-percent decrease in criminal activity, and a 20-percent increase in earned income. With regard to the patient matching status, the performance during treatment revealed that matched patients were more motivated during treatment, stayed in treatment longer, and had fewer irregular discharges than the mismatched patients. The 6-month followup results showed that matched patients had better outcomes in all categories than the mismatched . Matched patients had 27 percent better outcomes than the mismatched patients. The beneficial effects of matching were not confined to a particular treatment program or a particular patient group.

Such studies are of particular importance to the drug abuse treatment field and are long overdue. Additional research is needed to identify and test initial matching criteria. Criteria may be used to assign a particular type of patient not only to a treatment program but also to the appropriate treatment components and to the appropriate level of needed services. Research is also needed to identify whether additional factors particular to certain groups, such as racial or ethnic minorities or women, should be included in the matching strategy. To utilize the potential knowledge gained from research, a referral and treatment network, community-based and coordinated needs to be in place. Such a network could also reassign clients to another component or form of treatment if the initial treatment episode was not effective, or to aftercare services when the client was considered fit to reenter the community. All this research ultimately could lead to a practice that has been common for a long time in the management of other medical conditions, namely an individually tailored treatment plan that takes into account the drug abuser's history and needs.

Other Contemporary Issues Related to Treatment

Special Populations

Women--Substance abuse among women has not received adequate attention (160,311,314). Although the prevalence of illicit drug use is higher among men than women, the extent of the problem, the rising trends (especially for cocaine and crack use), and the consequences of drug abuse among women are alarming. The HIV epidemic has increased concerns about female drug use. Female abusers can be infected via drug-related or sexual behavior and subsequently transmit the virus to their partners and infants.

In 1988, approximately 9 percent (5.4 of the 60 million women of childbearing age (age 15 to 45) reported using an illicit drug in the past month (330). One million of these women had tried cocaine. A substantial majority of women seeking mental health services have had alcohol and other drug problems, which constitutes the second most frequent reason after depression for seeking treatment (32,212). Recent studies estimated that every year, 375,000 infants are exposed to illicit drug use *in utero*, nearly one-third of whom (100,000) are exposed to cocaine (51,53,122). Babies born to drug-using mothers tend to suffer higher mortality and morbidity rates. The consequences depend on the drug of abuse, the duration of use, and the dose taken. Death rates for infants of drug-using mothers are reported to be 4 times higher than for infants born to non-drug using mothers (160). Infants of abusers, especially of women using heroin, experience severe withdrawal symptoms after birth. In addition, *in utero* exposure may result in a spectrum of short- and long-term health impairments (219,277). At least one hospital study demonstrated that women using illicit drugs come from all socio-demographic groups (301). The rate of exposure among patients of private and public

hospitals was the same. Furthermore, there were no major differences in exposure between black and white women. Of those reporting illicit drug use, the majority of women in the above study (75 percent) reported use of cocaine (301).

With respect to drug use and HIV infection, the statistics are equally troublesome. Women make up 20 to 30 percent of the regular intravenous heroin-using population, an estimated 100,000 to 150,000 users (153). Currently, approximately 10 percent of all acquired immunodefociency syndrome (AIDS) cases are women. About half of them (52 percent) were IV drug users, and an additional 20 percent were infected by heterosexual contact with an IV drug-using partner (349). Furthermore, of the 2,258 AIDS pediatric cases as of May 1990, nearly 60 percent were caused by exposure to HIV that was related to IV drug use (IV drug use by the mother or her sexual partner).

Between 1985 and 1988 the death rate among women of reproductive age (15 to 44 years of age) due to HIV infection quadrupled (60). In contrast, rates of other causes of death among women of reproductive age have remained relatively constant in the last decade. In 1988, the death rate of black women was nine times the rate of white women (60). Young black women in New York were nearly four times more likely to die of HIV infection than young white women (30 per 100,000 v. 8 per 100,000 respectively). If current mortality trends continue it is estimated that HIV/AIDS will become one of the five leading causes of death by 1991 among women of reproductive age (60).

Medical costs for children born to drug-using mothers can be substantial. One study in Los Angeles estimated in 1986 that the hospital care for the extended stay of 915 drug-exposed babies (70 percent were exposed to cocaine) totaled $2.2 million (127). A report by the Office of the Inspector General for the U.S. Department of Health and Human Services Administration estimated that the health care and special services of crack babies will soon reach $500 million (122).

Despite the significance of the female drug abuse problem, the issue has not been extensively studied until recently (32,160). It appears that the causes of drug use, the natural history, and the needs of the female drug abuser are different from those of men (71,212). These differences have profound implications for appropriately addressing drug abuse treatment and prevention of HIV infection for female abusers. More specifically, research indicates that women are often influenced by intimate partners or male relatives to initiate and continue drug use and that their drug use serves a coping function in part as well as a desire to "get high." Women are more likely than men to use drugs at home, alone, or with intimate friends. Women's drug supplies depend primarily on their partners and friends. Female abusers also tend to have feelings of powerlessness and low self-esteem. They often lack a social network and face difficulties in maintaining intimate relationships. They tend to be very emotionally and sexually dependent on males (71,153,212). They often neglect themselves, and it is not uncommon for pregnant female abusers to delay identifying their condition and to wait until late in the course of pregnancy to seek prenatal care.

With respect to drug abuse treatment, women are often unrepresented and underserved (72,288). There are barriers for those women seeking treatment, and even for those who are admitted. Only a few centers provide a range of services tailored to their unique needs. According to one researcher, "male program staff...employed a confrontational therapeutic style uncomfortable for women, and directed them into gender stereotyped tasks and training" (56). Furthermore, treatment programs do not address the important issues of sexual exploitation and violence in which female abusers often live (56).

Most of the information on treatment effectiveness comes from studies with overwhelming majorities of male subjects. Some studies have found gender-related differences. One prospective study of urban black youth found that the benefits of treatment for heroin abuse were more evident among females than men (42). After entering treatment, the annual probability that a woman would be abstinent increased and was somewhat greater than men's. Similarly, in another prospective study of male and female drug abusers in a TC, De Leon and Jainchill found that females entered treatment with greater degrees of psychopathology,

but at followup showed greater improvement than males and seemed to require less time in treatment to achieve the same goals. Women's improvement appeared to be related to social role functions that were modified during residency at the TC (82).

Obstacles that have made it difficult to get women into treatment include their inadequate knowledge about drug abuse and its optimal management; lack of interest, insensitivity, and negative attitudes towards women; and insufficient resources (288). The hurdles pregnant abusers face in getting treatment for their abuse were illustrated in a recent study in New York City (54,57). According to a survey of 78 programs, fewer than one-half (46 percent) were accepting pregnant women. Furthermore, not all of these programs were equipped to address the special needs of pregnant women (less than half of the programs that did accept pregnant women provided prenatal care). Only two programs had provisions to accommodate the children of their female clients. Moreover, as the author states, "effective availability was further limited by restrictions on method of payment or specific substance of abuse" (55). Access to treatment was especially difficult for those women on Medicaid and using crack (56)

In 1989, the National Association of State Alcohol and Drug Abuse Directors estimated that the total number of women per year, including pregnant women, who are currently receiving treatment for alcohol and substance abuse is almost 550,000, with the total number of pregnant women being nearly 30,000. It was also estimated that 4 million women need treatment, of whom about 250,000 are pregnant (218).

Regardless of pregnancy, it is imperative that the needs of female abusers be addressed by the drug abuse treatment system and that they be reflected in the types of services offered by drug treatment programs. These needs can be identified by understanding the social, economic, psychological, and physiological dimensions of female drug abuse. Programs that tailor their services to women could integrate medical and reproductive care with psychiatric and counseling services, parenting training, day care, and social and rehabilitative services. A substantial amount of research on female drug users has been compiled, and comprehensive treatment programs, especially for crack and cocaine, have been proposed (358). Since no effective pharmacotherapy for cocaine is yet available, it is imperative that these programs be carefully evaluated.

Studies that examined the impact of comprehensive programs for treating drug abuse in pregnant women (especially heroin abusers) have found positive results, both in lowering mortality and in overall improvement of pregnancy outcomes (52,85,287). Reviewers state that studies demonstrate that when the health, legal, and child care needs of women have been addressed, treatment programs' retention and effectiveness rates have improved (13,149).

Both the cocaine and crack epidemics and the HIV epidemic have helped bring this issue to the forefront and may motivate the treatment system to better address the problem of female substance abuse. This multifaceted problem will require a multidimensional treatment approach that addresses women's special needs.

Populations Involved With the Criminal Justice System--There is an undeniable link between drug abuse and criminal activity. Heroin and cocaine abusers are among the most serious street criminals (190,304). It is estimated that each daily heroin user annually commits more than 100 crimes, such as burglary and theft (159). Furthermore, during periods of daily use, drug abusers' crime rates and incomes have been 2 to 6 times higher than during periods of nonuse or less than daily use. Less than one percent of self-reported crimes by cocaine and heroin abusers resulted in an arrest (159). A substantial majority of arrestees, however, also reported drug use. The Drug Use Forecasting program of the National Institute of Justice monitors recent drug use among a sample of persons arrested in selected U.S. cities. Data indicate that about 60 percent of arrestees in 1987 were using drugs other than alcohol before the time of their arrest (190). As noted in chapter 2, more recent data from 14 cities showed that the prevalence of cocaine use (confirmed with

urine testing) among arrestees was more than 50 percent in 7 cities. Although less than 10 percent of arrestees in 9 cities had positive urine tests for opiates, an overwhelming majority of those (81 percent) also tested positive for cocaine (336).

The reported statistics are similar with respect to inmate populations. Of all State prisons' inmates sampled in 1986, 62 percent reported having ever used illicit drugs on a regular basis; 43 percent reported daily use during the month before the most recent offense; and 35 percent were under the influence of a drug at the time of the offense (190,351).

In 1987, nearly 2 percent of the adult population in the United States (about 3.5 million) were under some form of correctional supervision (on probation, in jail or prison, or on parole) (336). Since drug use is so extensive among individuals in contact with the criminal justice system, an opportunity exists to fight the problem by providing drug treatment for this population. Although permanent abstinence may be an unlikely outcome for many of them, their drug use and criminality may be reduced. According to experts, there is currently limited treatment available for the drug abuse offender (12,13). It has been estimated that 11 percent of the total inmate population of State prisons are under substance abuse treatment (351). The majority of treatment programs consist of drug education, counseling, group therapy, and Narcotics Anonymous groups. Those who are not incarcerated but still in contact with the criminal justice system may be legally required to enter treatment in a community setting (351).

With respect to evaluation of prison-based programs, a recent review notes that, "outcome evaluations of prison-based programs also show reductions in criminal recidivism rates and that time in treatment is positively related to increased time until arrest" (351). This review was part of a planned study to evaluate the Federal Bureau of Prisons' drug abuse treatment programs. The evaluation will examine the effectiveness and efficiency of TC programs for substance abusers who are within 18 months of release from prison. This well-designed evaluation will provide valuable information on post-release drug use, criminal behavior, occupational and social functioning, and mental and physical health. It will also identify client characteristics and treatment components associated with positive outcomes.

Arrested drug abusers may be legally required to enter treatment for their abuse. In 1982, almost 30 percent of the clients who entered treatment programs were on probation, parole, or mandatory release (190). Evaluations specific to the legally coerced clients have been conducted. One form of legal coercion was the civil commitment programs of the 1960s. Civil commitment is defined as "a legal procedure that allows narcotics abusers or other drug abusers to be committed to a compulsory drug treatment program, typically involving a residential period and an aftercare period in the community" (12). Three different programs were established in the United States. As Anglin notes, however, although the intent of the enabling legislation and the design were quite similar, actual implementation differed and fell short for some of the programs (12).

Of all three, the California program seemed to have been the most successful. Addicts were admitted to the program and were subsequently released into the community under supervision. Daily narcotics use and property-related crime among the program participants receiving methadone maintenance during the 7 years of the commitment period were reduced by 21.8 and 18.6 percent, respectively (12,192). A comparison group comprised of abusers who were admitted to the program but were discharged because of legal errors reduced their daily use just by 6.8 percent and their criminal activities by 6.7 percent. Thus, there was a threefold improvement in the outcome measures for the program group as compared with those who were not involved in a program (12,13). Further analysis indicated that supervision with objective monitoring (i.e., urine testing) was found to be an important component of civil commitment (192). Leukefeld notes that although civil commitment may reduce IV drug abuse, it should not be considered a panacea. This point reinforces the experts' view that no panaceas exist for the drug problem as a whole. Rather, it seems that a balanced combination of several approaches has the potential to achieve the most benefit.

Another approach, the Treatment Alternative to Street Crime (TASC), has been described as another milestone in linking the criminal justice system and drug abuse treatment (190). These Federally funded and locally administered programs were initiated in 1972. Before Federal funding was withdrawn in 1982, 130 cites in 39 States had TASC projects; by 1987, 18 States had operational TASC programs (62). TASC is a bridging and coordinating mechanism between the criminal justice system and drug abuse treatment that employs an individualized, case management approach. Its function is to "identify, assess, and refer appropriate drug-dependent offenders accused or convicted of non-violent crimes to community-based substance abuse treatment" (62). TASC acts as an alternative or supplement to existing criminal justice sanctions and reports treatment results to the referring justice system component. Those who do not comply or violate regulations are returned to the criminal justice system to continue their legal processes or sanctions (62). Unfortunately, the program does not include comprehensive long-term evaluation. Several evaluations of TASCs have found that the programs provided a less costly alternative to incarceration and that TASC clients remained in community treatment longer than non-TASC clients (192).

A sample of TASC clients were in treatment programs participating in the TOPS study (in a limited number of cities and modalities). Some comparisons were possible between clients involved in TASC and other justice system supervision and voluntarily admitted clients. Multivariate analysis found that, in general, association with the criminal justice system was a significant predictor of retention (149). TASC clients were estimated to stay nearly 2 months longer in residential treatment and 45 days longer in ODF treatment than non-TASC clients. Furthermore, clients referred by the criminal justice system were significantly less likely to report weekly or more frequent use of their primary drug of abuse during the year after treatment. The investigators concluded that reduced criminal activity for criminal justice clients, both during and after treatment,"argues for the use of drug abuse treatment as alternative crime control technique" (149).

The TOPS study provided evidence that compared with other clients, those referred by TASC and the criminal justice system tended to be not as heavily immersed in their abuse careers and to be receiving treatment for the first time. This early interruption of the drug abuse career may account for the positive results that were found from this group. Researchers have suggested that these programs have a great potential to interrupt the abuse cycle and to produce long-term benefits by decreasing both drug use and crime among treated offenders (149,190).

Dual Morbidity

An association exists between psychiatric conditions and drug abuse. Persons with mental illness of virtually all ages and categories have a markedly elevated incidence of serious substance abuse (333). At the same time, there is a growing recognition that clients entering drug abuse treatment have a variety of psychiatric disorders. The prevalence of these dual-diagnosis patients appears to be increasing, perhaps due to better diagnostics (156,175). Kosten reports that opiate abusers with severe drug abuse are more likely to be depressed (175). Among opiate addicts, major depression was most common (54 percent), followed by alcoholism (35 percent), antisocial personality disorders (26.5 percent), and phobias (16 percent). He further notes that the proportion having any lifetime disorder (87 percent) is higher than among alcoholics. For cocaine abusers, Kosten reports a 30-percent prevalence rate of major and minor depression, and a 10- to 20-percent prevalence of bipolar disorders (manic-depression) (175). In general, it seems that the dually diagnosed patient falls along a continuum that ranges from mild psychiatric disorder and mild substance abuse to severe mental illness and a severe substance abuse problem (333).

Research indicates that the coexistence of psychiatric disorders appears to be a strong prognostic factor influencing the outcome of drug abuse treatment and the likelihood of relapse (149,175). This evidence makes it imperative that patients who enter treatment for drug abuse have a psychological assessment. If a co-existing psychiatric condition is diagnosed, then their treatment plan could include appropriate psychiatric care.

Polydrug Use

The increased prevalence of multiple drug abuse by the same individual (polydrug use) constitutes a major problem that carries serious consequences.

Drugs are used concurrently for a variety of reasons. They can be used, for example, to enhance or counteract the effect of the primary drug (as the case with the cocaine-heroin combination) or to serve as a temporary substitute for the drug of choice, which may not be available (149,177). Of particular concern is the increasing practice of injecting a mixture of cocaine and heroin ("speedballing") (24). Other common substances used by heroin and cocaine abusers are alcohol and sedatives, especially benzodiazepines (177).

An indication of the extent of the polydrug abuse problem is provided by data from the TOPS study. An overwhelming majority of clients entering treatment in methadone maintenance, TC, and ODF programs (over 70 percent) abused two or more drugs in the year prior to treatment. In all, 50 to 70 percent of the clients in each treatment modality used alcohol or marijuana in addition to their primary drug of abuse. The analysis of the data concerning drug use patterns indicates a reduction in the severity of drug use after treatment and substantial improvement, mainly accomplished by patients switching to less serious drugs and less complex patterns of use (shifting to alcohol and marijuana and becoming minimal users) (149).

Polydrug abuse complicates treatment, from the stage of detoxification to relapse prevention (177). Moreover, higher rates of psychiatric co-morbidity have been reported among polydrug users, which further exacerbate the problem (177). More research is needed to devise ways to treat this crucial problem. In the absence of "magic bullets," researchers have suggested that a combination of treatment regimens and strategies (from pharmacotherapy and psychotherapy to behavioral techniques) may help increase effectiveness (177,285).

Prevention of Relapse

Relapse, defined as the resumption of substance abuse following a period of abstinence, is the rule and not the exception among abusers entering or completing treatment (250). Thus, relapse can be considered to be a major factor contributing to the drug abuse problem. Indeed, without recurrence and relapse, "substance abuse treatment could be limited to a small subspecialty of medicine that concentrates on detoxification, handled in medical wards, emergency rooms, and outpatient clinics" (250).

Relapse to drug use is a complex, dynamic process that may involve several stages from the initial slip to readdiction (129,367). Several theoretical models based on genetic and metabolic or social learning theories have been proposed to explain relapse (129,367). Although the research in this area is not extremely advanced, partly because of methodological impediments, factors associated with relapse have been identified. The prevalence of a psychiatric disorder is a strong predictor of relapse, along with socially related parameters, such as commitment and motivation on the patient's part, the existence of social support networks and employment opportunities. Another category of relapse predictors includes variables associated with "cue reactivity." Relapse can be triggered by responses to environmental cues that act as "reminders." These are situations that over the course of the abuse career have been strongly associated with drug use. Conditioned cues may range from being in areas where drugs were purchased and being with drug-using friends to viewing money, white powder, or any item ever associated with drug use. Depending on the abuser, then, almost anything can produce drug use memories, strong urges, and cravings that might lead to drug-seeking behavior, even years after a successful treatment episode (58,232).

Because drug abuse is a chronic relapsing disorder, it should be regarded in a similar fashion as other chronic diseases (e.g., diabetes, arthritis, bipolar disorders, or chronic depression) (149,191,233,250). The pattern of relapse and remission resembles the nature of chronic diseases' patterns of remission and flare-up periods. As with many chronic conditions, no cure exists to eradicate the causes of drug abuse or the problem once it surfaces. The recognition that there is no perfect treatment for drug abuse has important implications for drug abuse treatment objectives. Two distinct yet interrelated objectives of drug abuse treatment are 1) the amelioration or reduction of symptoms (e.g., drug use) and 2) the prolongation of symptom-free intervals (e.g., maintenance of the desired behavior changes).

There is a growing consensus that relapse prevention techniques ought to be incorporated into the existing treatment system and taught to clients (129,149,233). Preliminary results from experimental studies have been promising (202,206,232). Nevertheless, more research is essential to gain a better understanding of the process of relapse and to identify which techniques are most suitable for particular patients. This knowledge could increase both the effectiveness and the efficiency of treatment. Relapse prevention becomes even more important in view of the cocaine surge because of cocaine's powerful reinforcing properties and the current lack of any pharmacologic treatment (58).

From both the treatment and policy perspectives, it is encouraging that many of the factors associated with relapse are environmentally influenced and thus amenable to various degrees of control. Therefore, interventions targeted to change these factors might play a significant role in reducing the demand for drugs, either by totally preventing relapse for some individuals or by considerably prolonging drug-free intervals for others. In both cases, society and the individual gain.

Aftercare Services

One dimension of relapse prevention is the provision of aftercare services. Aftercare can be conceptualized as long-term treatment or extended care similar to the management of other chronic conditions, such as bipolar disorders (manic depression). The most vulnerable time for relapse is during the first 3 months after leaving treatment, when the former abuser no longer has the protected environment of the treatment program (191). The purpose of aftercare services is to facilitate the treated abuser's integration into society. Provision of aftercare is based on the assumption that "continuing assistance following treatment can remove or reduce posttreatment factors which are associated with relapse, or strengthen those posttreatment factors which are associated with maintenance of sobriety" (140). This is accomplished by keeping contact with the treated individual and helping drug abusers make major life changes and cope with the personal, family, social, and professional challenges that they face during the recovery process. Model programs for aftercare treatment have been devised based on followup meetings, training sessions, drug-free social and community activities, vocationally focus strategies, social support strategies, and development of support systems through former abusers (140,378).

The empirical evidence is encouraging that aftercare services may reduce relapse rates (2,140,250,378). In a randomized trial of newly recovering opiate addicts who had been assigned to an experimental aftercare program and a control situation, McAuliffe found that the "intervention significantly reduced the probability and extent of relapse, helped unemployed subjects find work, and reduced self-reported criminality" (202). Clearly, more research is needed to formally evaluate a variety of such programs and to identify the most effective elements of their services.

TOPS data indicate that few clients from any treatment modalities received any type of aftercare services (149). It seems that scarce resources and more urgent competing needs have led to poor development of these services (378). Experts in the field agree that the current knowledge of relapse prevention that includes aftercare needs to be integrated into existing treatment packages (149,191). Aftercare programs can also take the form of consortia serving clients from multiple treatment facilities (140).

Given the potential that both relapse prevention and aftercare services hold for strengthening treatment's effectiveness and efficiency, the existing lack of applied research necessary for implementation is a severe stumbling block to further progress.

Future Research

It is apparent that much more can be done to increase treatment's effectiveness and efficiency. The conference "What Works: An International Perspective on Drug Abuse Treatment and Prevention Research," held in October 1989, identified major issues likely to lead to the achievement of these goals (195). One suggestion dealt with ways to increase the dissemination and use of information that has already been gathered on drug abuse treatment. Such suggestions included creating the environment

for technology transfer and creating ways to facilitate the diffusion of tested and established knowledge.

With respect to a future research agenda, the proposed topics emphasized research that would produce knowledge to improve treatment effectiveness and efficiency. Such research areas include the natural history of drug abuse (stages and process of recovery) among different sub-populations and the possible effectiveness of patient-program and patient-staff matching schemes. More research is clearly needed on the process of treatment, to understand why some treatment works, which elements make it work, what does not work, and, most importantly, to identify those treatment components that are effective for various groups. Research is also lacking on staff turnover, staff attitudes, program flexibility about treatment options, contact between staff and patients, and family involvement in treatment (241a).

Research on relapse prevention and aftercare also holds great importance. Moreover, there is a need to evaluate for different groups the safety, efficacy, and effectiveness of new techniques and alternative treatment methods (e.g., behavioral techniques such as contingency management and conditioning, acupuncture, and hypnosis). More information is also needed on those who do not seek treatment and the way they recover and on better techniques to attract and retain clients in treatment (195). Finally, the technology of conducting randomized studies in the field of drug abuse needs to be strengthened.

The Drug Abuse Treatment Outcome Study (DATOS), the third national study on treatment effectiveness following DARP and TOPS, is expected to address some of the areas previously identified as needing further research (322). Differential subgroup analyses will be performed, variables related to treatment retention and outcome will be examined, and treatment effectiveness will be compared with the drug use patterns of those who received no treatment. Further research will examine the prevalence of behaviors associated with the spread of HIV and investigate the effectiveness of treatment interventions designed to reduce these high-risk behaviors.

DATOS is being funded by NIDA and implemented by the Research Triangle Institute. The investigation will cover an estimated 20,000 clients enrolled in approximately 50 treatment programs (322). Five modalities will be included in the investigation: short- and long-term methadone maintenance, short and long-term TCs, and ODF treatment. The goal is to determine treatment effectiveness according to the illicit drug(s) used, type of treatment, and the degree of client impairment. An additional goal is to examine the process of treatment, especially as it relates to treatment outcome. Although a relatively short followup is planned (6 months), it is anticipated that longer followup studies will evolve from this data set.

Large national studies and smaller-scale studies are equally important in drug abuse treatment research. Although they may overlap, national and smaller-scale studies are able to address different kind of questions. Collective knowledge derived from both types of studies might provide answers to a variety of issues and strengthen drug abuse treatment.

SUMMARY AND POLICY IMPLICATIONS

Research has demonstrated that drug users are a heterogeneous group with multiple problems (78,149,271). The three major treatment modalities, which have changed little over the past 20 years, tend to attract clients with different sociodemographic and other personal characteristics and, therefore, serve diverse client types (149). Methadone maintenance, if properly implemented, can dramatically reduce illicit opiate use. High proportions of successful outcomes have also been observed among TC clients. These substantial improvements, however, are clouded by the low retention record of TCs. Many of the people attending ODF programs have also reduced their drug use and some of its consequences.

This chapter reviewed the evidence of drug abuse treatment effectiveness in general. Chapter 5 addresses the specific question of drug abuse treatment and implications for HIV spread. Treatment for drug abuse has the potential to

interrupt transmission of HIV infection by decreasing the frequency of drug use, especially IV drug use. These decreases imply reductions in sharing injection equipment, the primary vehicle of HIV transmission among IV drug users. Although methadone curtails heroin use, the lack of an effective and fast-acting treatment for cocaine may have dire consequences for those at risk.

The last few years have witnessed an evolution of new treatment programs and variations in the traditional treatments. Twenty-eight-day residential programs have become the most common form of treatment, and self-help groups, such as Narcotics Anonymous, have become prevalent. Intermediate levels of care, such as day-care, evening care, or halfway houses are becoming increasingly important (203). Linkages between self-help groups and methadone maintenance as an adjunct or aftercare service to long-term stabilized clients have been developed (231). There are TCs with planned treatment durations of 3 or 6 months. ODF programs have been tailored to treat cocaine abuse treatment (204,241). Although formal evaluations of these entities are not yet available, research is currently being conducted that may shed some light on the efficacy, effectiveness, and perhaps cost-effectiveness of the new approaches to drug abuse treatment.

Across all modalities in TOPS, of the clients who spent at least 3 months in treatment, 40 to 50 percent of regular (weekly or more frequent use) heroin and cocaine users stopped use completely 1 year after treatment, and an additional 30 percent reduced their use (149). Drug abuse and criminal activity consistently decreased. Dramatic improvements occurred during treatment, with some degree of deterioration immediately after and stabilization in the following years. Improvement was maintained up to five years after treatment (149).

Drug abuse treatment is intended mainly for people who are drug depended. Natural history studies have shown that some people may discontinue drug use without any formal type of treatment. Overall, it appears that the process of phasing out drugs is a function of a wide range of factors. These factors may be previous treatment episodes, criminal justice system involvement, critical life events, such as confrontation from family and friends, religious involvement, and other social conditions.

Drug abuse has been described as a "final common pathway, where genetics, psychological factors, or social environment might get you there, but once you're there, you're there" (167). Low retention in treatment and relapse have consistently hampered treatment efforts. Retention rates vary among modalities. An estimated 80 to 85 percent of entrants have dropped out of traditional TCs before 1 year, whereas a reported 60 percent of ODF clients have dropped out, transferred, or completed treatment by the third month (79,150). Methadone programs have experienced lower dropout rates, with a range of 15 to 45 percent for a 2-year period. Methadone dosage has influenced retention (low doses are associated with lower retention) (130,257,258).

Relapse to drug use is a major characteristic of drug abusers. As the DARP study showed, 75 percent of the followup sample relapsed one or more times over 12 years (267). Total abstinence may be hard to achieve, often requiring multiple treatment episodes (149,267). DARP data indicated that over 10 years, opiate abusers averaged 6 treatment episodes. Approximately 60 percent of those leaving treatment had another treatment episode in the subsequent 6 years (157,201). Similarly, almost 33 percent of TOPS clients returned to drug treatment in the year after leaving the program (149).

Even for those who cannot achieve total and permanent abstinence, treatment may be beneficial. In the TOPS study, all outcome measures dramatically improved during treatment. The long-term analysis of the DARP sample showed that more than 58 percent of all abusers in recovery at year 12 had quit while they were in a treatment program (267). Each treatment episode may lead to a drug-free interval in the drug-abuse career. Thus, treatment may initiate, facilitate, and accelerate the recovery process. The DARP analysis also demonstrated that the longer the duration of abstinence, the more likely the recovering abuser will continue being abstinent. Findings from research in a related area, nicotine

abuse and smoking cessation, provide further support to the above conclusions (118).

Drug abuse is clearly a condition of multiple dimensions both in its etiology and in its expressed outcomes and consequences. Drug abuse treatment performs well in many drug abusers but cannot affect all behavioral dimensions. "The major modalities have had more limited success in rebuilding the lives of drug abusers and reintegrating them into society" than reducing drug use (149). The interplay of factors beyond the reach of treatment (e.g., personal and social environment) may undermine recovering abusers' efforts to stay drug-free and become productive members of the society.

Confronting and treating drug abuse is a very difficult and demanding task. To sustain any behavior change requires a major commitment. Even relatively benign behavioral changes (e.g., exercise, weight loss) attempted by healthy and stable individuals may take time and several attempts to achieve improvement. A proportion may reach their goals and be able to maintain their desired behaviors (e.g., permanently quitting smoking), but others experience short periods of improved behavior followed by relapses into old behavior patterns.

In summary, different interventions seem to work for different groups of drug-abusing clients. Overcoming drug abuse may require multiple treatments and the provision of relapse prevention and aftercare services. Treatment for drug abuse is not a panacea. Rather it is an integral component of a long and committed effort to recover from drug abuse.

Treatment for Drug Abuse as a Strategy to Prevent HIV Infection

INTRODUCTION

The critical role of intravenous (IV) drug use in the spread of the human immunodeficiency virus (HIV) is well recognized and documented (216,239). Reflecting this reality, the Presidential Commission on the Human Immunodeficiency Virus Epidemic stated that the nation's ability to control the HIV epidemic depends on its ability to control the IV drug use problem (239). Providing treatment is indeed a cornerstone of any adequate strategy (105). Hubbard and colleagues proposed that treating drug abuse may have important direct (reduction of drug use) and indirect (improvement of immune function) effects on the HIV epidemic (see box 5-A) (148). Decreasing drug use for both HIV-positive and HIV-negative drug users is of great importance. In low prevalence areas, a window of opportunity exists to control the spread of the virus, so that the course of the epidemic will not parallel the past rises in seroprevalence rates seen among IV drug users in the already highly infected areas (25,28,68). In high prevalence areas, curtailing drug use could reduce further transmission of HIV.

This chapter briefly reviews the association between drug use and increased morbidity, addresses some of the methodological obstacles to the evaluation of drug abuse treatment as a strategy for HIV prevention, and reviews the relevant studies. Finally, the chapter examines other approaches to HIV prevention among IV drug users.

A decrease in drug use will most likely produce benefits besides decreasing the risk of spreading HIV. A threefold increase in overall mortality rates, AIDS incidence, and AIDS mortality rates was reported among IV drug users in methadone maintenance clinics in New York City between 1984 and 1987 (263). Similarly, from 1981 to 1986, narcotics-related deaths from AIDS and other causes, especially other infectious diseases, increased on average 32 percent. The investigators speculated that these deaths from other causes may also have been associated with HIV infection (286). For drug users in treatment, death rates were about 1.5 percent per year in contrast to the 3.5 to 8 percent for those not in treatment (88).

Box 5-A--Drugs of Abuse and the Immune System

There is evidence that opiates, as well as other drugs of abuse, exert immunosupressive effects on the immune system. These effects may be related to the drug itself, to some of the toxic substances used to process it, or to another factor associated with drug use (186,364). A related finding of importance is that methadone doses lower than 75 mg per day may reverse the immunosupressive effects of heroin, which suggests that methadone may in fact provide benefits besides curtailing heroin use to those in treatment (101). An effective dose is usually over 60 mg (257). Moreover, it has been reported that those in methadone maintenance treatment who are HIV positive and do not continue to inject drugs have a better functioning immune system than those who continue IV drug use (95).

A recent prospective study from Switzerland showed that cessation of IV drug use is associated with lower risk of disease progression among HIV positive subjects (365). For a median time of 19 months, researchers followed 355 HIV-positive patients who were not taking any antiretroviral therapy and fell into three categories: former IV drug users, enrollees in methadone maintenance during the study period, and continued users of IV drugs. Multivariate regression analysis showed that the latter group was almost 80 percent more likely to progress to acquired immunodeficiency syndrome (AIDS) than the groups who ceased IV drug use (odds ratio = 1.76). Lifetable analysis also revealed a significantly lower probability of disease progression among those who had stopped using IV drugs. After 3 years, the probability of progression to AIDS was 19 percent in former IV drug users, 24 percent in the methadone group, and 41 percent in the persistent IV drug use group (365).

Historically, IV drug users have had higher death rates from a variety of causes (overdoses, injuries, infections). They have suffered from an increased incidence of a range of infectious diseases, from all types of hepatitis and endocarditis to sexually transmitted diseases (gonorrhea, syphilis); central nervous system disorders; and skin, bone, and joint infections. All of these diseases have been reported to increase in recent years (139). Furthermore, recent studies indicate the presence of human T-lymphotropic viruses (HTLV-1 and HTLV-2) in some populations of IV drug users. These viruses have been associated with a neurologic disorder and with adult T-cell leukemia and lymphoma (139).

METHODOLOGICAL PROBLEMS

Any study of the effectiveness of treating drug abuse to prevent HIV infection involves a series of major methodological obstacles. The difficulty of establishing a cause-effect link in human studies, as discussed in chapter 4, is further exacerbated by the complex nature of HIV disease.

As is the case in other fields, the inclusion of an evaluation component in AIDS intervention programs is the exception rather than the norm (220,296). Despite the challenges that this type of evaluation poses, it is essential to conduct rigorously designed evaluation research with sufficient resources to provide policymakers with information necessary for the more effective and efficient use of resources.

Identifying the possible contribution of drug abuse treatment to the prevention of HIV infection relies on answering the following question: Did treating drug abuse with a particular modality have an effect in reducing the spread of the virus? The issue is whether the observed change was a direct consequence of the treatment or a result of one or more external, non-treatment related factors. The challenges that these question raise are discussed below.

Study Design Issues

Major difficulties in study design include the following: identifying members of a hard-to-reach population, such as drug users; recruiting them; and eliciting their cooperation for a study that could last several years. Such a study requires truthful answers about some compulsive and clandestine behaviors and practices, practices that may subject individuals to legal or social sanctions.

Random assignment to treatment modalities and control groups is not always possible. Many factors--personal, social, psychological, and legal--influence an addict's decision to enter and remain in treatment. The alternative to a randomized controlled experiment is the quasi-experimental design. Trade-offs between feasibility and the likelihood that the study will provide valid evidence of the treatment's effect become a necessity. Moreover, the more removed the study design is from a randomized clinical trial, the more prospects for a truly valid comparison fade. Subsequently, since the observed findings may not be attributed directly to treatment, alternative plausible explanations need to be considered to critically evaluate and perhaps explain any findings.

Study Outcome Issues

After the type of design option is settled, the next major question concerns choosing the types of outcomes that best demonstrate the effectiveness of the treatment. A number of potential outcomes exist and have been classified into three categories: biological, behavioral, and psychological (220).

Since, at present, preventing AIDS means halting the spread of the virus, the most direct measure of outcome is the actual seroconversion of abusers under treatment and not in treatment to HIV-positive status. Seroconversion, however, may be a rare event even among high risk-groups (220). On the other hand, annual rates up to 10 percent or more have been reported (145,203). Very low rates of seroconversion require that for researchers to be able to observe meaningful statistical differences, large numbers of subjects need to be recruited and retained for followup for a long time. Such a study is accompanied by the logistical and financial problems of testing and retesting people at frequent intervals for HIV infection (220).

An alternative option to the use of seroconversion or seroprevalence as an outcome measure in evaluation studies is the use of a surrogate disease with the same transmission patterns, such as hepatitis B. Another option is to use intermediate outcomes relating to behavior, such as sharing drug-injecting equipment or having unprotected sex, to measure the reduction of risk behaviors that lead to HIV infection. A last option is to use psychological outcomes that measure awareness or knowledge about the behaviors that lead to infection (220). It should be noted, however, that although awareness or knowledge may be important for some people, they do not necessarily induce behavior change (205). Which outcome measure to use is also a decision that involves trade-offs between feasibility and obtaining direct evidence. By employing behavioral and, even more so, psychological outcomes, researchers can examine more immediate impacts. On the other hand, the evidence for the treatment's effectiveness then becomes indirect.

Regardless of the outcome measure used, another serious question is the duration of the study. What is a sufficient time, not only to observe differences in behavior but also to maintain them, and how often should outcomes be measured during the study period?

Measurement Issues

Measurement of any type of outcome raises issues of reliability and validity (173,249). Reliability is the reproducibility of the results over repeated measurements and relates to the lack of random error over these repeated measurements. Validity refers to the lack of systematic error, that is, whether the measurement reflects what it is intended to measure. These common issues are of particular concern when self-reported data are used, in this case behaviors that may be private and illegal. In addition, the retrospective collection of information exacerbates problems of recall.

There is evidence that reliability may be less of a concern than validity when people report drug-related behavior (220,296). In some studies, data collected from drug treatment centers under conditions of confidentiality have correlated well with urine testing results (200). In another study, however, the results were conflicting and produced evidence that several variables influence accurate self-reporting. In this study, the validity of self-reporting depended on the type of drug examined, with self-reporting for opiates less valid and for cocaine highly valid. Younger age and the use of paraprofessional staff were associated with a decreased rate of underreporting (199). Similarly, in an experiment at San Francisco General Hospital's methadone detoxification clinic, the rates of self-reported needle-sharing increased from 40 to 60 percent when the patients were interviewed by staff not affiliated with the clinic instead of clinic staff (189).

Another critical issue in these types of evaluations is whether to focus the measurement and the analysis on the individual or the total population of drug users and partners in a specified area. It is suggested that because the final outcome of transmission reduction is a function of the drug-using and sexual behaviors of both HIV-positive and HIV-negative individuals, the unit of measurement should be the community rather than the individual (296). However, it seems that both measures have a useful role to play in treatment evaluation. In addition, community-based research is a task with its own challenges.

Validity of the Results

The goal of a well-designed and thoroughly executed study is to eliminate or at least reduce possible sources of bias. Reducing biases ensures internal validity by decreasing the likelihood that the results are distorted and lead to misleading conclusions. But not all factors are amenable to control. Of particular concern in researching AIDS issues is the "background noise," which refers to the mass of information about the epidemic and its associated risk behaviors. This background noise has the potential to confound the outcome, thus making it almost impossible to attribute any effect solely to the treatment or other intervention under study (215). Randomized controlled trials usually can overcome these difficulties.

After the validity of the results is addressed, the task remains of extrapolating them to other populations (external validity). Those drug abusers who

were accessible, available, motivated, and willing to cooperate and complete the study may have some unique known or unknown characteristics that make them different from other abusers who did not participate. As in any study, caution should be exercised in generalizing the results to other groups in the same city, let alone to different regions of the country.

EFFECTIVENESS OF DRUG ABUSE TREATMENT TO PREVENT HIV INFECTION

There is a growing body of literature on programs to prevent HIV infection among IV drug users. The data demonstrate that drug users are capable of altering behavior to protect themselves and their partners (91,273). It is of concern, however, that drug users are less likely to change sexual practices than injection practices. A variety of studies indicate that a higher proportion of IV drug users change practices to reduce needle-sharing or clean equipment than practices related to heterosexual transmission (26,27,341).

Despite the relative availability of studies examining behavior changes for HIV prevention among IV drug users, few studies have examined the role of drug abuse treatment in preventing HIV infection. These few studies have employed different designs and different outcome measures. All but TOPS examine the effect of one treatment modality, methadone maintenance, on reducing IV drug use, and with varying strength of evidence, all point to the conclusion that methadone maintenance is beneficial in halting the spread of HIV.

Reduction in Drug Use and Risk Behaviors

The Treatment Outcome Prospective Study (TOPS) provided useful data for examining the effect that treatment regardless of modality had on behavior associated with HIV transmission, and more specifically, on IV drug use (149). During the year preceding admission, approximately 65 to 70 percent of all clients in the three admission cohorts who responded to the interview (80 percent of all clients entering treatment) were regular IV drug users. The proportion of IV drug users in various time periods (up to 3 to 5 years) after treatment was approximately 25 to 30 percent of the clients sampled for followup. This decline of IV drug use was similar for the three cohorts that entered treatment in 1979, 1980, and 1981.

The investigators suggest that this marked decline in IV drug use was a direct result of treatment and not of fear and awareness of AIDS, since these changes were similar across the three admission cohorts before and after widespread knowledge of AIDS. Treatment may exert a beneficial effect by reducing overall drug use, thus leading to reductions in IV drug use. The investigators suggest that treatment for drug abuse, "is an effective means of reducing the risk of exposure to HIV infection" (149). Without a comparison group of untreated IV drug users, however, the role of other factors is not clear.

It is troubling that those who remain regular IV drug users seem resistant to changing the route of drug administration (149). Although treatment improvements may reduce even further the number of these hard-core users, different approaches may be needed to reduce the risk of HIV infection among this group.

Ball and colleagues conducted a carefully designed 3-year study of 6 methadone clinics in 3 Eastern U.S. cities to evaluate the effectiveness of methadone maintenance not only in reducing drug use but also in reducing needle-sharing (20,21). In the winter of 1985-1986, 633 male methadone patients, including those already in treatment and new admissions, were interviewed, and 506 (80 percent) were reinterviewed 1 year later. Of those reinterviewed, 107 had ceased treatment at the time of followup. Although 98 percent of the patients had been IV users, the prevalence of IV drug use at admission was 81 percent because some abusers had been incarcerated or in another drug treatment program prior to their admission. For those who remained in treatment, the mean time in treatment was 45 months. Overall, among the 388 patients (61 percent) who remained in treatment for 1 year or more, the prevalence of IV drug use decreased by 71 percent. The largest drop in prevalence occurred during the admission period (from 81 percent with IV use to 63 percent), and subsequently the decline continued at a slower rate to 29 percent for those in

treatment 4 years or longer. In contrast, the annual relapse rate for those who ceased treatment was 82 percent, and the probability of relapse was directly related to the time out of treatment.

Patients were classified into 5 groups according to treatment status at last IV drug use (before current admission, at admission, during treatment, last year, and current IV drug use). A sizable proportion, 36.4 percent of the 324 patients for whom information was available on sharing practices, reported that they shared needles during their last or current period of IV drug use; however, only 9 percent of all patients in treatment were currently sharing needles (21). The investigators also compared the frequency of needle-sharing among these groups. The results showed that the frequency of needle-sharing days per month was significantly lower for those patients whose last IV drug use occurred after admission to treatment compared with the needle-sharing days of those patients whose last IV drug use occurred at or before admission. This finding suggests that treatment had a positive effect in reducing this high-risk behavior even among those who continued IV drug use while in treatment. In grave contrast, for all those who had been out of treatment for 10 to 12 months, the proportion of needle-sharers was 48 percent (21).

A special methadone maintenance clinic for IV drug users who are infected with HIV, have symptoms of the disease, or have AIDS has been operating at the San Francisco General Hospital (23). An evaluation of 42 people enrolled in this program at 3 and 12 months showed that heroin use in the past 30 days had decreased from a mean of 28 days use to 7 days, a statistically significant difference. Cocaine use decreased, but to a lesser degree. Sexual activity had also decreased overall, but the rate of condom use remained the same. The 12-month results were quite similar to the 3-month findings (280).

HIV Infection and Entry Into Treatment

The next set of studies provide indirect evidence of methadone maintenance's protective effect. These studies looked at cohorts entering methadone maintenance at different times and observed that those who entered treatment earlier in the course of the epidemic and remained in treatment had lower HIV infection rates. This finding implies that methadone maintenance had a beneficial effect in preventing infection by reducing IV drug use, especially at the time of HIV spread. Although those who remain in treatment longer may be self-selected, nevertheless these studies underscore the importance of having the drug user in treatment early in the spread of HIV in a specified area for treatment to exert its maximum protective effect.

A retrospective followup study of 995 patients entering methadone maintenance in the Bronx between 1978 and 1987 was conducted (132). The analysis showed that the year of entry into treatment was the strongest predictor of AIDS incidence: 11.4 per 1,000 person years for those entered before 1983 as opposed to 33.0 per 1,000 person years for later entrants. Regression analysis, which controlled for age, sex, race, entry selection factors, and length of treatment, showed that the year of entry was a stronger predictor of AIDS than race, with odds ratios of 2.6 and 1.1, respectively. One subgroup of 362 patients was enrolled in a longitudinal seroprevalence study to examine the association between methadone maintenance and HIV status. Data from this group showed an inverse relationship between the length of time in methadone maintenance and HIV seropositivity (132).

In a similar study, 239 methadone maintenance patients in a New York hospital were interviewed between 1986 and 1987 and classified into cohorts according to the year of entry into methadone maintenance. Among the three cohorts entering methadone maintenance before 1982, between 1982 and 1984, and after 1984, the HIV-seropositive rates at entry were 35 percent, 54 percent, and 57 percent, respectively (1). Lower seroprevalence rates among the earlier cohorts who continued methadone maintenance at a time of rapid spread of HIV in New York City testify to the protection offered by this modality.

Another study tested clients from 28 methadone maintenance centers in New York City for HIV from June 1988 to January 1989 and found that new entrants were 1.7 times more likely than longer-term clients to be HIV-positive (295).

In a similar analysis, 2,430 patients enrolled in methadone maintenance between 1972 and 1988 were studied to examine the relationship of IV cocaine use to HIV infection and AIDS. IV cocaine use was significantly associated with both HIV infection and AIDS mortality. Subsequent analysis revealed that entrance into methadone maintenance after 1980 was an independent predictor of HIV status and of AIDS and pneumonia deaths, with odds ratios exceeding 2.0 Low daily methadone dose (less than 60 mg) was also found to be associated with HIV antibody and with testing positive for heroin and cocaine use (376). In addition, those on 60 mg or more per day were less likely to relapse and more likely to remain in treatment (327).

A study of 454 people in drug abuse treatment clinics in New York City in 1989 examined demographic, behavioral, and clinical features of HIV infection. Multivariate analysis revealed that lower methadone dose and shorter period of drug treatment enrollment were significant predictors of HIV-positive status (40).

Also in New York City, Novick and colleagues in 1985 reported that the prevalence of HIV antibodies was 23 percent among patients in methadone maintenance as opposed to 47 percent among those not in treatment. The lowest rates were observed among those who had the longest treatment stays in methadone maintenance (228).

History of methadone maintenance treatment and HIV serostatus were examined in a cohort of 2,112 heterosexual IV drug users in San Francisco from 1985 to 1989. Those who had spent more than 60 months in methadone maintenance had half the risk of being HIV positive of those with less than 60 months (odds ratio = 0.5, confidence interval 0.35 to 0.70) (374).

The same pattern of lower seroprevalence rates among drug abusers who entered treatment early in the epidemic and remained in treatment has been observed in other countries. In Sweden, patients were tested at admission and retested during subsequent treatment. The prevalence of HIV-positive patients admitted before 1983 was 3 percent, but it was 16 percent for those admitted in 1984 and 1986 and 57 percent for those admitted in 1987 (36). There was no seroconversion to HIV-positive status among those who tested negative upon admission since 1984 and were still on the program in December 1987. Likewise in Italy, the HIV rate was 21 percent for the 1981 to 1985 entrants into methadone maintenance, and 62 percent for those entering after 1987 (291).

Medical Maintenance

The concept of medical maintenance has been described in chapter 3. Stable, non-drug using, socially rehabilitated methadone maintained subjects receive their methadone from a physician in intervals as far apart as 28 days. It is reported that among the 58 respondents from the qualified group of socially rehabilitated and stable methadone maintenance clients who received their methadone at the office of a primary care physician, none was HIV-positive (229).

Interim Methadone Maintenance Program

The interim methadone maintenance program is a measure proposed by the National Institute on Drug Abuse and the Food and Drug Administration that is intended to curb the spread of HIV among IV drug users, especially among those on waiting lists for methadone maintenance. This concept calls for faster provision of methadone and HIV counselling without additional ancillary services (counselling, vocational and educational training, urine testing) until treatment space in a comprehensive program becomes available. This proposal by the U.S. Department of Health and Human Services in 1989 raised considerable debate and sharply divided the drug treatment community. The Department has since withdrawn the proposal for interim methadone. The issue nevertheless arises here because of its implications for preventing HIV infection among IV drug users.

Two relevant studies provided what seemed to be conflicting results with respect to the benefits of providing methadone alone. A closer examination of these studies, however, reveals that there is not necessarily a conflict between their findings, as they address different issues. The first study was conucted in New York City and provided evidence of a

beneficial effect (264). IV drug users on a waiting list to enter methadone maintenance were randomly assigned to two groups. One (36 subjects) received methadone daily, urine testing twice a week, and an interview, and the other (26 subjects) received only urine testing twice a week and an interview. At baseline, needle use averaged 95 times per month for both groups; at followup (after at least 30 days), needle use had decreased to 33 times per month for the methadone group but remained almost unchanged, 87 times per month, for the control group. The prevalence of heroin use for the experimental group dropped from 60 percent to 29 percent, while it remained almost stable from 62 to 60 percent for the control group. Cocaine use continued the same for both groups. It was also reported that the mean number of days since last drug injection was 33 days for the treatment group, significantly longer than the mean of 7 days for the control group. In addition, improvement in quality-of-life scores was observed for the methadone group.

Preliminary results from an ongoing study in Philadelphia have been used to argue against interim methadone. This study is designed to identify the "active ingredients" of a methadone maintenance program (59). To accomplish this, three levels of methadone maintenance services are being compared: 1) minimum methadone maintenance, with only methadone, emergency counselling, and referral services; 2) basic methadone maintenance, with counselling and urine testing, but no other additional services (family or employment counselling); and 3) enhanced methadone maintenance, with a more comprehensive set of services (medical and psychiatric care, social work, family therapy). Those who participate in the study are randomly assigned to one of these methadone maintenance levels. The followup time is 6 months, and outcome measures include IV drug use and high-risk behaviors for HIV infection.

This is an ongoing study, and data collection is in very early stages. One interim outcome measure is the proportion of patients who required "protective termination." According to the investigators, this outcome indicates an unacceptable level of illicit drug use. The criteria used were 1) either 8 total or 4 consecutive opiate-positive urine tests during the 24-week intervention, 2) either 12 total or 6 consecutive cocaine-positive urine tests during the same time period, or 3) 3 or more psychiatric emergencies. Investigators observed that more than half the participants in the minimum methadone maintenance group met the "protective termination " criteria, while none in the enhanced methadone maintenance did so. This finding pertains to a small number of patients but is statistically significant. Of the 15 patients assigned to minimum methadone maintenance so far, 9 met the protective termination criteria, while 2 of the 12 assigned to basic methadone maintenance did so. None of the 15 assigned to the enhanced methadone maintenance met the requirements. Although the interim report stated that blocking doses of methadone were offered, it did not report the mean dose or mention dose as a possible factor in interpreting the results. Because inadequate dosage can confound the results, evaluating the non-pharmacological components of methadone programs requires provision of an adequate dose and controlling for dose in data analysis.

When completed, this study is expected to provide useful insights regarding the relative effectiveness of methadone maintenance programs and their effects on HIV-related high-risk behaviors. If the results demonstrate the increased effectiveness of the more comprehensive methadone maintenance services, they will be in accordance with previous findings that program factors, more than client characteristics, play a major role in reducing IV drug use among methadone maintenance clients and in improving treatment effectiveness (21). On the other hand, such findings and preliminary results would not provide evidence that an interim methadone program is ineffective, since at least 40 percent of those in the minimum methadone maintenance reduced or eliminated their IV drug use (6 out of 15 who remained on minimum methadone maintenance). From the public health perspective, it would be a gain if a similar proportion of IV drug users on a methadone maintenance waiting list in a highly infected area abstained from IV drug use and needle-sharing. Such a reduction would be another step in breaking the chain of HIV spread.

Those who support the interim concept argue that existing capacity cannot accommodate everyone

who seeks treatment. For those who want to enter methadone maintenance and are placed on a waiting list, the alternatives are limited. To the extent that their physical dependence on opiates leads them to continue shooting heroin intravenously to alleviate drug hunger and withdrawal symptoms, they continue to engage in the high-risk behavior of needle-sharing (225). The provision of interim methadone and HIV counselling to those individuals who cannot be admitted because no comprehensive treatment is available attempts to offer an immediate response to this urgent situation.

Opponents of interim methadone argue that the multiplicity of problems that drug abusers bring with them into treatment--psychiatric disorders, multiple drug abuses, other illnesses, limited or no education, unemployment, legal problems, and homelessness--calls for an uncompromised, comprehensive approach to the whole problem. During current efforts to expand treatment capacity and improve its quality, some have argued that relaxing drug treatment requirements through an interim program would send the wrong message and "undermine the foundation of treatment structure" (235,363). Moreover, there is the danger that the existence of an interim methadone program in a given treatment facility would increase pressure on the staff to discharge clients prematurely and to admit those who are on the waiting list. More importantly, opponents argue, despite the intention of patients to transfer to a more comprehensive setting, given the existing realities, they might remain on interim status indefinitely. Thus, the interim methadone program might evolve from a temporary substitute for comprehensive treatment to a "permanent and less costly part of the treatment system" (235,363).

All these concerns are worth considering. The HIV epidemic, however, adds an additional dimension to the problem and warrants a clear focus on societal priorities. Of the estimated 500,000 heroin users in the United States, approximately 400,000 are not currently in treatment (225). The increased outreach efforts initiated by the HIV threat are, and will continue, bringing more people to treatment. It is unclear whether and how the system is prepared to respond in a timely fashion. Interim methadone has been proposed exclusively as an alternative to continued heroin injection in the street by the hundreds of thousands of heroin users who do just that three or more times every day.

It is important to note that since methadone has no pharmacological action against cocaine, IV use of cocaine may continue. Thus, the argument is used that interim methadone will have a minimum impact on IV drug use, and will not protect against HIV spread. Not all heroin users, however, also abuse cocaine intravenously. Rates of IV cocaine use, are lower in most narcotics addicts than their rate of injecting heroin (9). A survey in 1989 of 24 methadone maintenance centers around the country revealed that the prevalence of concurrent use of cocaine varied from 0 to 40 percent (299). In 8 programs, the prevalence ranged from 20 to 40 percent; in the remaining 16, it ranged from 0 to 15 percent. In 5 methadone maintenance clinics surveyed in New York City, the proportion of cocaine users was between 8 and 21 percent in 4 of the programs and 40 percent in the fifth (299). It seems, however, that cocaine abuse may fall while heroin abusers attend methadone maintenance, most likely among those who use one drug to mitigate the effects of the other. TOPS data showed that the proportion of regular cocaine users decreased from 26.4 percent 1 year before methadone maintenance treatment to 9.4 percent at 3 months in treatment (149).

The potential for HIV spread exists each time needle-sharing and injection occur. These are practices in which people both outside the treatment milieu and those on waiting lists for methadone maintenance engage. With respect to the latter, findings from a still unpublished study are of particular concern, although the numbers are small. This study showed that of those opiate abusers seeking treatment in New Haven in 1988 who were not IV drug users at the time of clinic intake, 35 percent (6 of the 17 patients who were intranasal heroin users) either started or resumed IV drug use by the time of admission, 1 to 4 months later (256).

Pharmacologically, an adequately high dose of methadone addresses the biochemical aspects of heroin abuse by blocking drug hunger and the onset of opiate withdrawal symptoms. In practical terms, those individuals who respond to methadone will

stop the IV use of heroin, breaking one link in the transmission chain of HIV. Any sustained reduction in injection frequency reduces the rate of HIV transmission. In medical and epidemiologic terms, this is a very important step toward shrinking the pool of people at risk of spreading or contracting HIV infection. From a public health perspective, this is a need that cannot be ignored. It is possible that interim methadone maintenance programs may be more appropriate for certain areas, such as those with a large number of IV drug users and long waiting lists (for example, for New York City as opposed to a rural community) (see ch. 3). Concerns for deterioration of existing services because of interim methadone might be addressed by the "development of appropriate guidelines for both interim and comprehensive maintenance treatment and monitoring by an appropriate quality assurance agency" (9).

ADDITIONAL APPROACHES TO PREVENT HIV INFECTION

To understand better the contribution of drug abuse treatment as a strategy to prevent HIV infection, one must consider a framework of policies. These policies in turn should be based on consideration of the following facts: that the probability of contracting HIV is a function of many variables and that drug users in treatment may differ in attitudes and motivations from drug users not in treatment.

The probability of contracting HIV from drug use is a function of both the risk from needle use and the risk from sexual practices. In both cases risk depends on the prevalence of HIV infection among partners and their infectiousness. The risk from needle use also depends on the number of persons sharing equipment, the use of rented or borrowed needles, the frequency of injection, and the frequency and effectiveness of needle-cleaning behaviors. The risk from sexual practices depends on the type of practice, the number of partners, and the frequency of preventive measures, such as condom use.

Moreover, drug users differ widely in their attitudes and practices. Some drug users smoke or sniff heroin, cocaine, or amphetamines but do not yet inject them. In addition, of those who are using drugs intravenously, the vast majority are not currently in drug treatment; some have a desire to enter but cannot, due to the lack of available space, and some simply do not want to get treatment for their drug abuse (45,239,324,332a). Of those who are in treatment, some actively sought it and are motivated to complete it. Others are not personally motivated; although some kind of family, social, or legal pressure brought them into treatment, they also may respond to treatment. Finally, some enter treatment for temporary relief from the "hustle" of drug use or to reduce their tolerance to the abused drugs.

This diversity makes it essential from a public policy perspective to distinguish between risk elimination and risk reduction, with the latter being a viable and vital public health objective. The justification for such a distinction is further reinforced by the reality that there is no immediate, effective way to treat cocaine abuse, a tragic reality that has direct consequences for the spread of HIV infection.

From the public heath perspective, the objective is to control the HIV epidemic. A comprehensive HIV prevention strategy needs to keep a sharp focus on this objective and to recognize all the above realities. Both the urgency of the epidemic and a realistic assessment of drug abuse dictate that there should be a hierarchical structure of tactics against HIV infection, and appropriate multiple policies should take account this structure. As Sorensen has stated with regard to drug use, tactics include total abstinence, not injecting drugs, not sharing needles, and, if sharing needles, then cleaning needles effectively. With regard to sexual activity, the hierarchy consists of abstinence, monogamous relationships, and safer sexual practices, including use of condoms with casual and regular partners (281).

The Importance of Preventing IV Initiation

Preventing drug sniffers and smokers from switching to injection can eventually reduce the pool of eligible people at risk of spreading HIV. The most common factors mentioned among heroin sniffers that promote initiation of IV use are fear of tolerance to sniffed heroin and social pressure from friends who inject drugs. Clearly, programs are

necessary to address these issues, perhaps by emphasizing techniques to cope with social pressure and providing counselling about HIV infection (93).

Risk Reduction Through Needle-Exchange Programs

To prevent HIV transmission, short of abstinence, risk reduction implies safer drug and sexual practices. One approach is to provide the means for safer practices, in an attempt to reduce the harm associated with IV drug use to both the user and society. The means for safer practices are clean needles, bleach to disinfect used equipment, and condoms. The provision, especially of materials related to safer IV drug use, is considered controversial because of the argument that the mere provision of injection equipment encourages drug use and consequently leads to increased use. There is no empirical support, however, for such an argument.

Needle exchange programs in which a person can exchange used needles for new ones have been operating in England, Holland, Australia, and a few sites in the United States. The premise is that scarcity of injection equipment contributes to sharing and multiple uses, thus increasing the chances of HIV transmission. Those who support these programs view them as one of the many HIV prevention strategies making up a comprehensive strategy to halt the spread of the infection. These programs are targeted specifically to the large numbers of drug users who are not in treatment and who continue to inject drugs and share needles. In fact, these programs may provide the vehicle for educating people not in treatment and for recruiting them into treatment. The underlying philosophy is that, "keeping drug users alive is more important than keeping them clean. Recovery is possible after relapse, but it is not possible after death" (278).

Opponents argue that providing injection equipment sends wrong messages, since abstinence from drug use is inconsistent with exchange of needles. They argue that these measures may be perceived as condoning drug use and that the provision and availability of needles will lead to increased drug use.

The evaluation of needle-exchange programs raises serious methodological problems and is often hard to conduct. Biased selection into the program and high turnover of this population with losses to followup are major obstacles to valid evaluations. Furthermore, even if these programs are shown to be effective in reducing high-risk behaviors that lead to HIV infection, it is even harder to identify their contribution to slowing HIV infection in a community. Nevertheless, advances in research methods have allowed rigorous research, including randomized controlled studies, to be conducted in areas, such as treatment for drug abuse, previously considered impractical. Methodological problems, therefore, should not stymie efforts to evaluate needle-exchange programs.

Despite methodological problems, studies have been performed both in Europe and the United States. An evaluation of a program in London found that in the year prior to the exchange scheme, 49 percent of 133 participants had shared needles (131). Seventy-six of the initial sample of 133 were reinterviewed for a second time. Approximately 1 month and 4 months into the program, 85 and 89 percent respectively, had not shared needles in the 4 weeks before the interview. An evaluation was also performed of a program in Tacoma, Washington (96). The evaluation examined the number of opportunities for HIV infection, i.e., the frequency of injection with used or borrowed equipment, among 106 participants. A statistically significant decline was observed from a frequency of 62 injections per month with used or borrowed equipment before the exchange to 44 per month after the exchange. Another analysis of drug use trends from the same program found no significant difference in the overall rate of drug injection before and after participation in the program (125). Findings from all these studies, however, come from self-reported behavior. None of the studies had a control group, and the representativeness of the IV drug users interviewed was not clear.

It is difficult to evaluate the effect of such programs in slowing the rate of HIV transmission in a particular community, especially because of the long latency period of HIV infection. Hepatitis B infection is transmitted among IV drug users through

the same routes as HIV and has a considerably shorter latency time. A 1989 evaluation of the Amsterdam needle-exchange program, which was initiated in 1984, included an assessment of the annual incidence of hepatitis B infection. The incidence of hepatitis B infection declined steadily from 49 per 10,000 drug users in 1984 to 9 per 10,000 in 1989. This decline, as the authors state, "indicates that a change in injecting behavior indeed seemed to occur among IV drug users in Amsterdam" (70).

Summarizing presentations at the Fifth International Conference on AIDS in 1989, Wohlfeiler commented that needle-exchange programs may serve as contact points for education and referral (Wohlfeiler 1990). In the recent "What Works" conference on drug abuse treatment, Stimpson examined strengths, limitations, and areas of further development with respect to these programs. Based on information from Europe and Australia, the author concluded that syringe exchange programs have attracted people with lower levels of risk behavior and have experienced high turnover and low retention rates. Stimpson found that injectors who attend syringe exchange programs reported desirable, although small, changes in behavior (272). A recent evaluation study was particularly enlightening in understanding needle-exchange programs (354). This study showed that needle-exchange programs did not automatically lead to sweeping changes in high-risk behaviors, although the proportion reporting borrowing or lending of syringes decreased over time among participating IV drug users (354). The authors speculated that a combination of providing the means to reduce risk and intense counseling may be needed to produce the necessary drastic changes in risk behavior. Their point underscores the importance of comprehensive strategies that consider the complexities of drug abuse.

Overall, available studies do not provide evidence to support claims that provision of needles makes non-IV drug users switch to IV use or that such provision leads to increased drug consumption. In fact, decreases in the frequency of sharing have been reported. On the other hand, available studies do not allow one to conclude that needle-exchange programs alone reduce risky behavior. The design of the studies so far has not allowed researchers to separate the effects of the program from other influences, such as the characteristics of the users who continue to participate. This situation has often characterized community intervention studies. Needle-exchange programs have raised heated debates. The urgency and threat of the HIV epidemic, however, make it even more important that innovative prevention approaches have a fair chance to be tested and evaluated.

Sale and Possession of Injection Equipment

Public policies in the United States limit availability of injection equipment. It is illegal in all but 11 States to sell syringes without a prescription (87). Furthermore, drug paraphernalia laws make possession of injection equipment illegal in almost all States (87).

Certain European countries do not have laws restricting the sale and possession of injection equipment. Research conducted in France, Austria, and Scotland, countries that allow over-the-counter sales of syringes, assessed the impact of programs that educate pharmacists about the need to prevent HIV. There were large increases in the number of drug users purchasing and using sterile injection equipment (87).

Paraphernalia laws that make it illegal to possess injection equipment are impeding evaluation of over-the-counter sale of syringes in those States permitting purchase without a prescription. The clear and present danger of the HIV epidemic increases the pressure for reevaluation of public policies with regard to the purchase and possession of syringes, especially since there is no empirical support to claims that mere availability of injection equipment leads to increased injections (27,87). Since sharing occurs because of scarce injection equipment and for social reasons, preventing the spread of HIV infection among IV drug users may be enhanced by complementary measures to providing treatment or just providing the means for safer practices, such as interventions to change social patterns with regard to sharing. Wiebel states that "social networks of IV drug abusers as a whole should begin to discourage the sharing of drug injection equipment--including rinse water, cookers and

cottons--or at least the sharing of syringes that have not first been disinfected" (372).

The Role of Outreach Programs

Implementing effective strategies to prevent HIV infection calls for access to as many IV drug users as possible, both those who are in treatment and those who are not. Drug treatment programs provide the means for the former, while outreach programs may accomplish the latter.

An estimated 130,000 clients in drug and alcohol treatment facilities as of Sept. 30, 1989 were IV drug users at the time they started treatment (332a). On the other hand, the estimated number of IV drug users in the United States ranges from 1.1 to 1.8 million (45,64,324). *That 10 to 20 percent of IV drug users in the United States are in treatment at any time* implies that at least one million or more are not in treatment. Since it is estimated that approximately 80 percent of IV drug users have sexual partners that are not using drugs, a target population of over 1.8 million may be engaging in high-risk behaviors for contracting HIV (318). Estimates of IV drug users and their sexual partners at risk of HIV infection have reached as high as 4.5 million (243).

Because so many IV drug users are not in treatment, outreach programs could make a substantial contribution. In Chicago, 42 percent of those contacted through an AIDS outreach project had never been in treatment (370). Similarly, in New Jersey, 40 percent of those persons redeeming vouchers for a free detoxification program had never been in treatment (152).

A variety of community-based programs in more than 50 cities in the United States are tailored to reach drug users not in treatment and their sexual partners. The majority of trained community outreach workers are ex-abusers themselves. The effort to reach those groups takes workers to shelters, street corners, and shooting galleries. The operating premise is first to reach the addict, next to gain his or her confidence, and then to provide a series of HIV-prevention activities. Such programs offer individual or group educational sessions with instructions on safer drug use and safer sexual practices, HIV testing and counselling, and referrals to drug treatment and other social services. Outreach programs through their contacts with drug users who are not in treatment are a key vehicle for applying measures that may be appropriate for successful risk reduction efforts, such as information on AIDS prevention, provision of the skills to accomplish desired behavior change, and reinforcement for long-term maintenance (92).

The National AIDS Demonstration Research Project, an ongoing program, is the largest U.S. intervention program relating to IV drug users not in treatment (340). As of July 1990, 41 community-based projects throughout the country have enrolled 38,635 IV drug users and their sexual partners (341). According to one of its principal investigators, it has already demonstrated that it is feasible to identify and educate active drug users in the community setting (369). Preliminary results show that IV drug users not in treatment can modify their behavior to reduce the risk of HIV infection (369). The data have indicated that 50 percent or more of those who received an intervention reduced the frequency of IV drug use. The intervention included intensive counselling, skills training, educational materials, and peer group support (37).

Preliminary data based on followup interviews of 1,584 IV drug users who were recruited between 1987 and 1989 and who had completed both the initial and first 6-month followup interviews are available from five cities: San Francisco, Chicago, Miami, Philadelphia, and Houston (341). Followup rates in all cities but Houston were greater than 65 percent (45 percent for Houston). Substantial proportions reported decreasing IV drug use, from 49 percent in San Francisco to 75 percent in Miami. These figures include complete cessation of all IV drug use from 16 percent of followup respondents in Chicago to 47 percent in Miami. Similarly, the proportion reporting either never sharing or never borrowing "works" increased between baseline and followup. Substantial percentages of respondents reported decreases in sharing or borrowing injection equipment. Of those respondents who continued to inject drugs at followup, except for those who reported always using new needles, 20 to 39 percent reported increased use of bleach. Reported use of condoms also increased in all five cities. Overall,

however, reported reductions in sexual behaviors (use of condoms with steady or multiple partners) lagged behind reduction of high-risk drug use behaviors.

There is also evidence that outreach programs, by encouraging drug abusers to seek treatment, have increased the demand for treatment (107). For example, in Tacoma, Washington, of 218 treatment vouchers distributed, 75 percent were redeemed and led to detoxification treatment. Almost half of those who entered detoxification treatment (48 percent) were subsequently transferred to methadone maintenance (244). Nearly 50 percent of 1,884 IV drug users in New Jersey redeemed their coupons for free and immediate entry to 21- or 90-day methadone treatment (341). The proportion of individuals in the National AIDS Demonstration Research project entering formal drug treatment varied from 14 to 35 percent, with the lowest rates in Miami and Houston (14 and 15 percent, respectively), where the capacity of publicly funded drug abuse treatment programs is reported to be limited (341).

Similarly encouraging results are reported by Watters and colleagues from a community-outreach program in San Francisco (361,362). Elements of the outreach program included provision of bleach and condoms and a clandestine needle-exchange program. A series of seven cross-sections of 2,114 heterosexual IV drug users, 57 percent of whom were not enrolled in treatment programs at the time of the interview, between 1986 and 1989 revealed a change in HIV high-risk behaviors (362). The proportion reporting no needle-sharing gradually increased from 8.8 percent in 1986 to 53 percent by late 1989. Decreases in needle-sharing were also reported among IV drug users entering treatment in San Francisco (124). A combined measure of needle hygiene, which included frequency of use of bleach, no needle-sharing, and cleaning syringes with alcohol, increased nearly five times. At baseline in 1986, needle hygiene was reported 13 percent of the time, while in 1989 it was reported 80 percent of the time (362). Frequency of injection for both those in treatment and those not in treatment declined over time. Condom use increased significantly over time from 4 percent to nearly 30 percent by late 1989. Hepatitis B cases among injection drug users diagnosed at San Francisco General Hospital declined from 36 percent in 1987 to 23 percent in 1989. Although HIV seroprevalence almost doubled from 7 to 13 percent between 1986 and 1987, it thereafter remained at about the same level, 11.4 percent in 1989 (362). Overall, it has been reported that seroconversion in San Francisco has also leveled off at 2.4 percent annually (124). These reported major behavior changes of key risk behaviors coincided with the implementation of outreach efforts.

It should be noted that providing the means for IV drug users not in treatment to switch to safer behaviors (bleach, condoms) reaches those at high risk of contracting and transmitting HIV. These people may include those who want treatment and are on waiting lists, those who are contemplating and with some encouragement may seek treatment, and those who currently do not have a desire to stop using drugs. From the public health perspective, provision of material on safer practices is a justified action. Overall, these outreach programs may lead to behavior changes, perhaps not for all users and perhaps not each time they engage in drug or sexual activities. Because AIDS is such a lethal infectious disease, any gain in delaying the infection from spreading to more people is important. Any decrease in injection frequency is likely to reduce the risk of further HIV spread.

SUMMARY

The findings of available studies are consistent, despite the various designs and outcome measures used. Methadone maintenance has a positive effect in reducing the spread of the HIV virus, because, if properly implemented, methadone maintenance can help reduce or even eliminate abusers' desire to inject drugs. Time spent in treatment and adequate methadone dosage have been consistently found to be important predictors of successful outcomes, in particular, reduction of drug use and needle-sharing practices.

No studies similar to the ones described above for methadone maintenance clinics have been performed among patients of therapeutic communities or outpatient drug-free programs. With an average stay of

18 to 24 months in traditional therapeutic communities, a study would require a long followup time.

Risk behaviors leading to HIV infection are not confined to IV drug users seeking methadone maintenance treatment. It has been reported that 20 percent to 75 percent of those entering therapeutic communities report either IV drug use or unprotected sex (22,33). It would be reasonable to assume that, given the substantial drug-free rates for those who complete treatment or even stay a substantial amount of time in treatment, this modality has the potential to reduce the high-risk behaviors associated with the spread of the HIV, at least among those who stay in treatment for a certain time.

From the public health perspective and for society's benefit, spread of HIV infection needs to be halted. Prevention and control of the HIV epidemic among IV drug users, their partners, and offspring require comprehensive strategies that reflect the epidemiological characteristics of HIV infection and the complexities of drug abuse. Drug treatment alone, despite its effectiveness in reducing IV drug use and needle-sharing, is not sufficient. The fact is that an overwhelming majority of IV drug users are not in treatment (45,218,332a,341). As many as 1 million or more not in treatment engage every day in behaviors that place them at high risk of contracting or transmitting HIV. Outreach programs are an integral component of intervention strategies aimed at those IV drug users not in treatment. Preliminary results from different parts of the country have found that IV drug users not in treatment are either stopping drug use or changing their behavior to reduce the risk of HIV infection (341). Outreach programs also generate demand for treatment (341). Experience from New Jersey and Washington has shown that when financial barriers to treatment are reduced, drug users who have never been in treatment come forth and enter treatment.

Finally, it is increasingly important to reconsider the desirability of additional interventions aimed at IV drug users not in treatment, such as needle-exchange programs and providing methadone and HIV counseling to those on waiting lists. Fears that exchange programs will lead to increased injection are not supported by empirical evidence. Providing blocking doses of methadone to heroin users on waiting lists seems to be a better public health measure than having them continue daily injections of heroin. In light of the urgency of the epidemic, it is reasonable to consider these and other programs to reduce drug users' risk of contracting HIV.

Overall, it should be emphasized that regardless of the intervention to prevent HIV spread, what is ultimately important in medical and epidemiologic terms is the fact that any sustained reduction in injection frequency is likely to reduce the rate of HIV transmission. Such efforts need to be consistent and persistent over time to break the chain of HIV transmission.

Appendix A
Method of the Study

The Office of Technology Assessment undertook this Background Paper in response to a request from the House Committee on Government Operations, Subcommittee on Human Resources and Intergovernment Relations. The Subcommittee asked OTA to examine what is known about the effectiveness of treatment for drug abuse and analyze the implications for controlling the spread of human immunodeficiency virus (HIV) which causes acquired immunodeficiency syndrome (AIDS).

The analysis was based on information gathered from a wide range of sources. The process included review of published and unpublished studies and related material and extensive discussions with researchers in the field, both from Government and academia.

In July 1990, OTA convened a workshop to discuss a draft of the report. Workshop participants included researchers in the field of drug abuse and AIDS from academia, research organizations, and the Government. The draft report was sent for review to the workshop participants and other experts from a range of disciplines and interests. During July and August 1990, OTA staff revised the report on the basis of the workshop discussion and the comments of other reviewers.

Appendix B
Workshop Participants

A workshop to review and discuss the draft report was held on July 10, 1990. OTA would like to express its gratitude and appreciation to the following participants for their review and advice:

Lincoln Moses, workshop chair
Professor of Statistics
Stanford University
Stanford, CA

Douglas Anglin
Director
UCLA Drug Abuse Research Group
Neuropsychiatric Institute
Los Angeles, CA

Diane Canova
Director of Public Policy
National Association of State Alcohol
and Drug Abuse Directors
Washington, DC

Don Des Jarlais
Director of Research
Chemical Dependency Institute
Beth Israel Medical Center
New York, NY

Jessica Gardom
Public Health Advisor
Center for Prevention Services
Office of the Director (HIV)
Centers for Disease Control
Atlanta, GA

Scott Holmberg
Chief, Special Studies Section
Epidemiology Branch
Division HIV/AIDS
Centers for Disease Control
Atlanta, GA

Robert Hubbard
Senior Social Psychologist
Center for Social Research and
Policy Analysis
RTI
Research Triangle Park, NC

Jerome Jaffe
Assistant Director
Office for Treatment Improvement
Alcohol, Drug Abuse, and Mental Health
Administration
Rockville, MD

Nancy Jainchill
Senior Research Scientist
Therapeutic Communitites of America
New York, NY

Carl Leukefeld
Deputy Director
Division of Clinical Research
National Institute on Drug Abuse
Rockville, MD

Linda Lewis
Assistant Deputy Director for Treatment
Office of National Drug Control Policy
Executive Office of the President
Washington, DC

William McAuliffe
Principal Investigator
Project Outreach
Cambridge, MA

Robert Newman
President
Beth Israel Medical Center
New York, NY

Richard Rawson
Executive Director
Matrix Center
Beverly Hills, CA

Claire Sterk
Visiting Scientist
Center for Prevention Services
Division of STD/HIV Prevention
Centers for Disease Control
Atlanta, GA

Appendix C
Acknowledgements

In addition of the workshop participants listed in appendix B, OTA would like to thank the following individuals for their valuable contributions in the preparation of this Background Paper:

Robert Battjes
Assistant Director for Planning
Division of Clinical Research
National Institute on Drug Abuse
Rockville, MD

John Ball
Senior Scientist and Professor
Addiction Research Center
Baltimore, MD

Vincent Biase
Supervising Director, Technical Services
DAYTOP Village
New York City, NY

Jack D. Blaine
Chief, Treatment Research Branch
Division of Clinical Research
National Institute on Drug Abuse
Rockville, MD

Graham Coltidz
Assistant Professor of Medicine
Harvard Medical School
Boston, MA

James Cooper
Assistant Director for Medical and International Affairs
Office of the Director
National Institute on Drug Abuse
Rockville, MD

James Curran
Director
Division HIV/AIDS
Centers for Disease Control
Atlanta, GA

George De Leon
Director of Research and Training
Therapeutic Communities of America
New York, NY

Sam Di Menza
Assistant Deputy Director
Office for Treatment Improvement
Alcohol, Drug Abuse, and Mental Health Administration
Rockville, MD

Mindy Fullilove
Assistant Professor of Clinical Psychiatry and Public Health
Columbia University
New York, NY

Henrick J. Harwood
Senior Policy Analyst
Office of National Drug Control Policy
Executive Office of the President
Washington, DC

Harry Haverkos
Director
Division of Clinical Research
National Institute on Drug Abuse
Rockville, MD

Steven Jones
Medical Epidemiologist
Office of the Director (HIV)
Center for Prevention Services
Centers for Disease Control
Atlanta, GA

Herbert Kleber
Director for Demand Reduction
Office of National Drug Control Policy
Executive Office of the President
Washington, DC

Thomas Kosten
Assistant Professor
Department of Psychiatry
Director of Research
Yale University School of Medicine
New Haven, CT

Frederick Mosteller
Roger I. Lee Professor Emeritus of Mathematical Statistics
Technology Assessment Group
Harvard School of Public Health
Boston, MA

Gary Noble
Deputy Director for AIDS
Centers for Disease Control
Atlanta, GA

Roy Pickens
Director
Addiction Research Center
Baltimore, MD

Richard Schottenfeld
Assistant Professor of Psychiatry
Yale University School of Medicine
Connecticut Mental Health Center
New Haven, CT

Joanna Siegel
Post Doctoral Fellow
Department of Health Policy and Management
Harvard School of Public Health
Boston, MA

Dwayne Simpson
Director
Institute of Behavioral Research
Texas Christian University
Fort Worth, TX

James Sorensen
Professor
Department of Psychiatry
University of California, San Francisco
San Francisco, CA

Michael Torny
Professor of Law
University of Minnesota and Castine Research Corp.
Castine, ME

Appendix D

Glossary of Abbreviations and Terms

Glossary of Abbreviations

AA	--Alcoholics Anonymous
ADAMHA	--Alcohol, Drug Abuse, and Mental Health Administration (PHS, DHHS)
ADMS	--Alcohol, Drug Abuse, and Mental Health Services
AIDS	--acquired immunodeficiency syndrome
APA	--American Psychiatric Association
CA	--Cocaine Anonymous
CDC	--Centers for Disease Control (PHS, DHHS)
CJS	--Criminal Justice System
CODAP	--Client Oriented Data Acquisition Process
DARP	--Drug Abuse Reporting Program
DATOS	--Drug Abuse Treatment Outcome Study
DAWN	--Drug Abuse Warning Network
DHHS	--Department of Health and Human Services
DSM-IIIR	--Diagnostic and Statistical Manual for Mental Disorders (Third Edition Revised)
ER	--emergency room
FDA	--Food and Drug Administration (PHS, DHHS)
HIV	--human immunodeficiency virus
HTLV-1	--Human T-cell lymphotropic virus-1
HTLV-2	--Human T- cell lymphotropic virus-2
IV	--intravenous
LAAM	--levo-alpha-acetyl-methadol
LSD	--lysergic acid diethylamide
ME	--medical examiner
mg	--milligram
NA	--Narcotics Anonymous
NADAR	--National AIDS Demonstration Research
NASADAD	--National Association of State Alcohol and Drug Abuse Directors
NDATUS	--National Drug and Alcoholism Treatment Unit Survey
NIAAA	--National Institute on Alcohol Abuse and Alcoholism (ADAMHA, PHS, DHHS)
NIDA	--National Institute on Drug Abuse (ADAMHA, PHS, DHHS)
ODF	--outpatient drug free
OTA	--Office of Technology Assessment (U.S. Congress)
OTI	--Office of Treatment Improvement (ADAMHA, PHS, DHHS)
PCP	--phencyclidine
PHS	--Public Health Service (DHHS)
RCT	--Randomized Controlled Trial
SADAP	--State Alcohol and Drug Abuse Profile
STD	--sexually transmitted disease
TASC	--Treatment Alternative to Street Crime
TC	--therapeutic community
THC	--delta-9-tetrahydrocannabinol
TOPS	--Treatment Outcome Prospective Study
VA	--Veterans Administration (now Department of Veteran Affairs)

Glossary of Terms

Alcoholics Anonymous (AA): A self-help support group for assisting recovery from alcoholism. The process is based on the 12 steps to recovery, which include admitting addiction, acknowledging one's impotence to stop without the help of a higher power, and confronting the harm one has done.

Acute: A condition that has a sudden onset, sharp rise, and short course (compare *chronic*).

Acquired immunodeficiency syndrome: see *AIDS*.

Aftercare: Program services that concentrate on a successful transition between program completion and reentry into the community.

Agonist: A substance that occupies receptors in the brain and activates the receptor eliciting a drug effect or action (compare *antagonist*).

AIDS (acquired immunodeficiency syndrome): A disease caused by the human immunodeficiency virus and characterized by a deficiency of the immune system. The primary defect in AIDS is an acquired, persistent, quantitative functional depression within the T4 subset of lymphocytes. This depression often leads to infections caused by micro-organisms that usually do not produce infections in individuals with normal immunity.

Antagonist: A substance that tends to nullify the action of another, i.e., a drug that binds to a cell receptor without eliciting a biologic response, and competitively blocks access to that receptor for other drugs or displaces them from the receptor terminating their action (compare *agonist*).

Chronic: Lingering and lasting, as opposed to acute. A term used to describe persistent disease.

Cocaine: An addictive psychoactive substance that is a central nervous system stimulant.

Cocaine Anonymous: Self-help support groups for cocaine abusers patterned after the Alcoholics Anonymous approach.

Co-morbidity: See *dual-diagnosis*

Control group: In a randomized clinical trial, the group receiving no treatment or some treatment with which the group receiving experimental treatment is compared. The control treatment is generally a standard treatment, a placebo, or no treatment.

Cost-benefit analysis: An analytical technique that compares the costs of a project or technological application to the resultant benefits, with both costs and benefits expressed by the same measure. This measure is nearly always monetary.

Crack: A smokable form of cocaine converted from cocaine powder by mixing it with baking soda or ammonia and water and heating to remove the water.

Drug abuse: According to the American Psychiatric Association's diagnostic manual (DSM III-R), drug abuse is characterized by maladaptive patterns of psychoactive substance use that have never met the criteria for dependence for that particular class of substance (see *drug dependence*). Drug Abuse refers to a pattern of drug use that results in harm to the user; the user continues use despite persistent or recurrent adverse consequences.

Drug addiction: See *drug dependence*.

Drug dependence: A disorder in which a person has impaired control of psychoactive substance use and continues use despite adverse consequences. It is characterized by compulsive behavior and the active pursuit of a lifestyle that centers around searching for, obtaining, and using the drug. According to the American Psychiatric Association, diagnosis of drug dependence is established if at least three out of nine defined symptoms have been persistent for at least one month or have occurred repeatedly over a longer period of time. The range of symptoms include inability to control use, compulsive use, continued use despite knowledge of adverse consequences, tolerance, and physical dependence (compare *drug abuse*).

Dual diagnosis: Coexistence of drug abuse or dependence and psychiatric disorder.

Effectiveness: Same as efficacy (see below) except that it refers to average or actual conditions of use.

Efficacy: The probability of benefit to individuals in a defined population from an intervention applied for a given problem under ideal conditions of use. Efficacy is generally evaluated in controlled trials of an experimental therapy and a control condition.

Epidemic: A sudden increase in the incidence rate of a human illness, affecting large numbers of people, in a defined geographic area.

Heroin: An addictive psychoactive substance derived from opium. Heroin is administered mainly intravenously.

Human immunodeficiency virus (HIV): The virus that causes AIDS.

Inpatient care: Care that includes an overnight stay in a medical facility.

Interim methadone: A concept that calls for providing methadone and HIV counseling without additional ancillary services to IV drug users on waiting lists, until treatment space in a comprehensive program becomes available.

Intravenous: Injected into or delivered through a needle into a vein.

In utero: Literally, "in the uterus," referring to procedures that are performed or events that take place within the uterus.

Low birthweight babies: Live births weighing less than 5-1/2 pounds (2,500 grams).

Maturation: In evaluation studies, the impact on outcome of the passage of time, independent of the intervention being evaluated.

Medical maintenance: An approach that calls for stable, non-drug using, socially rehabilitative methadone-maintained patients to receive their total methadone dosage from a physician at a primary care setting at intervals as far apart as 28 days.

Methadone maintenance: Pharmacotherapy for narcotics addicts that employs a synthetic opiate, methadone, to stabilize clients and help them to function in the community. In addition to daily oral doses of methadone, methadone maintenance programs have traditionally included counseling and other support services.

Modality: In this report, a type of treatment for drug abuse.

Mortality rate: The death rate, often made explicit for a particular characteristic, e.g., age, sex, or specific cause of death. A mortality rate contains three essential elements: 1) the number of people in a population group exposed to the risk of death (the denominator); 2) a time factor; and 3) the number of deaths occurring in the exposed population during a certain time period (the numerator).

Naltrexone: A pharmacologic substance that is a narcotic antagonist.

Narcotics: A class of drugs that when administered therapeutically can lessen sensibility, relieve pain, and produce sleep. The term narcotic is used interchangeably with the term opiates. In a legal context, the term narcotics is used to refer to any substance that can causes dependence.

Narcotics Anonymous: Self-help support groups for narcotics abusers patterned after the Alcoholics Anonymous approach.

Natural history: The course of a condition, such as drug abuse, that occurs without any intervention.

Odds ratio: A measure of association closely related to relative risk. It is the ratio of the odds of a disease's occurring in individuals exposed to the risk relative to those unexposed.

Opiate: Any substance deriving from the opium poppy. Opiate drugs (e.g., morphine and heroin) bind to specific receptors on nerve cells scattered throughout the brain to reduce pain and produce euphoria. Repeated use of these agents may be associated with biological tolerance and dependence. Naturally produced molecules (e.g., endorphin, encephalin) bind to the same nerve cell receptors and are called endogenous opiates or opioid drugs. See *narcotics*.

Outpatient care: Care that is provided in a hospital or other medical facility that does not include an overnight stay.

Outpatient drug-free (ODF) program: A diverse group of drug abuse treatment programs operating on an outpatient basis, with emphasis on counseling.

Perinatal: Pertaining to or occurring in the period shortly before or after birth; variously defined as beginning with the completion of the 20th to 28th week of gestation and ending 7 to 28 days after birth.

Pharmacotherapy: The use of medication to treat a medical disease or disorder.

Placebo: A drug or procedure with no intrinsic therapeutic value. In a randomized clinical trial, a placebo may be given to patients in control groups as a means to blind investigators and patients as to whether an individual is receiving the experimental or control treatment.

Polydrug abuse: Substance abuse characterized by use of multiple drugs.

Premature births: Babies born between 20 to 36 weeks gestation.

Prevalence: In epidemiology, the number of cases of disease, infected persons, or persons with disabilities or some other condition, present at a particular time and in relation to the size of the population.

Psychoactive substance: A substance that has mood-altering abilities.

Randomized clinical trial: An experiment designed to test the safety and efficacy of an intervention in which people are randomly allocated to experimental or control groups, and outcomes are compared.

Reliability: Refers to the reproducibility of results over repeated measurements, and relates to the lack of random error over these repeated measurements.

Selection bias: A distortion of study results by correlates of the study subjects that influence the outcome and the comparability of the experimental and control groups.

Seroconversion: The initial development of antibodies specific to a particular agent.

Seropositive: In the context of HIV, the condition in which antibodies to the virus are found in the blood.

Seroprevalence: Prevalence based on blood tests.

Shooting gallery: Location where drug abusers meet to inject (shoot) drugs, often sharing needles.

Therapeutic community (TC): Residential treatment programs lasting approximately one year or more and characterized by a highly structured and confrontational approach. The TC philosophy views drug abuse as a reflection of personality problems and chronic deficiencies in social, educational, and marketable skills.

Tolerance: Increasing resistance to the effects of a drug. An outstanding characteristic of opiates and amphetamines, it results in a need for increasing dosage to maintain or recapture the desired drug effect.

Validity: A measure of the extent to which an observed situation reflects the "true" situation. Internal validity is a measure of the extent to which study results reflect the true relationship of an intervention to the outcome of interest in the study subjects. External validity is a measure of the extent to which study results can be generalized to the population which is represented by individuals in the study.

Withdrawal symptoms: Symptoms associated with abstinence from a drug on which a patient is physically dependent.

Appendix E
Psychoactive Drugs Other than Narcotics and Stimulants

Chapter 2 presented information about illicit drugs whose use has been most frequently associated with the transmission of the human immunodeficiency virus (HIV). In addition to narcotics and related analgesics, including heroin, and central nervous stimulants, including cocaine and crack, psychoactive drugs fall into four additional categories: sedative-hypnotics, hallucinogens, phencyclidine, and cannabis and inhalants. This appendix reviews the major characteristics of substances in each of these four categories.

Sedative-Hypnotics and Other Central Nervous System Depressants

Sedative-hypnotics are sometimes referred to as tranquilizers and sleeping pills. Barbiturates ("downers") and benzodiazepines are the two major categories of sedative-hypnotics. These drugs are usually sold in capsules and tablets. Like narcotics, sedative-hypnotics can cause both physical and psychological dependence and tolerance.

The effects of sedative-hypnotic drugs vary enormously with dosage. When taken in low-to-moderate doses, these substances tend to decrease inhibitions and relieve anxiety. In higher doses, barbiturates may cause slurred speech, staggering gait, and uncertain reflexes--effects that make driving a car or operating machinery particularly dangerous. The main danger and fatal consequences of these drugs reside in their depressant action on central nervous system sites. The combined depressant effect of taking significant doses of two drugs from this class, e.g., alcohol and diazepam (Valium), can be fatal. Unlike narcotics, "sedative-hypnotics have a withdrawal syndrome that is life-threatening, specifically as a result of seizure and delirium tremens" (6).

Hallucinogens

Hallucinogens or psychedelics, which are usually taken orally, do not resemble any of the other classes of drugs mentioned above, though they are frequently contaminated with other drugs, such as phencyclidine (PCP) and amphetamines. Profound changes in mood, thought content, perception, sensations, and emotions are common effects of hallucinogens. First-time users of these drugs in particular have been known to experience "bad trips" where the drug user experiences feelings of panic, confusion, paranoia, anxiety, and helplessness. The effects of psychedelics are often unpredictable and depend on the amount taken and factors relating to the user's mood and surroundings. Although researchers have found some changes in the mental functions of heavy users of lysergic acid diethylamide (LSD), it is not yet known whether such changes are permanent or disappear when LSD use is stopped (312). Although psychedelic drugs are quick to produce high tolerance, there is no hallucinogen withdrawal reaction as there is with narcotics, stimulants, and sedative-hypnotics, and hallucinogens rarely produce a full dependence.

Phencyclidine PCP

Phencyclidine, commonly referred to as PCP or "angel dust," was developed in the 1950s as an anesthetic, but was subsequently taken off the market for humans in 1967 when it was discovered that the drug caused hallucinations in some individuals. PCP is sometimes classified as a hallucinogen "because in toxic doses it typically produces severe agitation, excitement, and quasi-psychotic reactions including paranoid delusions and auditory hallucinations" (6). In low doses, however, PCP may simply cause drowsiness or excitability but no hallucinosis effect. PCP is available in a number of forms, and it can be swallowed, smoked, sniffed, or injected, and is often mixed with other drug such as marijuana and other hallucinogens. Although PCP is illegal, it is relatively easy to synthesize and is manufactured illicitly in basements, vans, and garage-type laboratories all over the country (315).

PCP has two distinctive use patterns. PCP has a street reputation as a "bad" drug and after trying it once, many users will not try it again. Others, however, use PCP chronically. It is not yet fully understood why toxic PCP doses vary from one person to the next, and why its effects are so highly unpredictable. "Because PCP is an anesthetic compound it produces the inability to feel pain which can lead to serious bodily injury," especially since the effects of the drug tend to cause unpredictable outbursts, bizarre behavior, and disorientation (315).

Evidence is inconclusive as to whether tolerance and withdrawal symptoms result from PCP use.

PCP-addicted expectant mothers have been known to deliver babies with visual, auditory, motor disturbances, and symptoms similar to adult users of PCP (e.g., agitation and rapid changes in awareness).

Results from the 1988 household survey indicated that an estimated 6.1 million (3.1 percent of people over the age of 12) have tried PCP at least once in their lifetimes and that about 377 thousand (0.2 percent) have used PCP during the past year. The prevalence of PCP use in one's lifetime increased from 1985 to 1988 from 2.8 percent to 3.1 percent, with the percentage of Hispanics report having used PCP sometime within their lifetimes more than doubling (from 1.4 percent in 1985 to 3.0 percent in 1988). Regional trends show that between 1984 and 1988, the prevalence of lifetime PCP use increased in the Northeast (2.4 percent to 4.3 percent), in the North Central region (3.0 percent to 3.8 percent), and in the West (3.2 percent to 3.7 percent), but decreased in the South (2.7 percent to 1.7 percent). These figures may reflect selective emigration of drug users or a change in reporting bias instead of a real reduction in the percent of lifetime users. PCP was the only drug category reporting an increase in use among high school seniors from 1988 to 1989 (current use rose from 0.3 percent to 1.4 percent and annual use rose from 1.2 percent to 2.4 percent). This increase followed a decreasing trend in lifetime prevalence among high school seniors since 1980. The number of PCP-related emergencies reported by the Drug Abuse Warning Network increased somewhat from 6,242 mentions in 1984 to 8,403 mentions in 1988.

Cannabis and Inhalants (Toxic Vapors)

Substances made from the cannabis plant (including marijuana and hashish) and inhalants have been grouped into a category of their own because they do not readily fit into any of the other drug categories.

The main psychoactive ingredient in marijuana is THC (delta-9-tetrahydrocannabinol). The present strength of marijuana, which is determined by the amount of THC in the drug, is up to ten times greater than marijuana used in the early 1970s (312). Several researchers and laboratories have recently made progress in determining how marijuana acts on the brain (321). Researchers have found that THC changes the way sensory information gets into and is acted on by the hippocampus, the component of the brain that facilitates learning, memory, and the integration of sensory experiences with emotions and motivation (321). Their findings help explain the symptoms of lethargy and attention and memory problems associated with acute marijuana use. There is little evidence that marijuana produces tolerance or severe physical withdrawal symptoms, though long-time users may become psychologically dependent on the drug.

Although cannabis is sometimes regarded as a substance of low abuse potential, it does have some serious health dangers. Inhaling the drug can be harmful to the lungs. Researchers at the University of California, Los Angeles, "found that the daily use of 1 to 3 marijuana joints appears to produce approximately the same lung damage and potential cancer risk as smoking 5 times as many cigarettes," (321). Very few, however, use at this rate. After smoking marijuana, users may experience faster heartbeat (an increase by as much as 50 percent) and pulse rate, bloodshot eyes, lack of concentration, and impaired reaction time and motor coordination. It is also known that chronic use of marijuana may cause babies to be born prematurely, shorter in length, and with below average birthweights (380).

The intentional use of inhalants, such as glue sniffing, is popular among some adolescents, in part because these chemicals are readily available and inexpensive (312). Other substances known to be inhaled include gasoline, paint thinners, and cleaning fluids. Nearly all of the abused inhalants produce effects similar to anesthetics, which slow the body's functions. Initial effects may also include nausea, sneezing, coughing, nosebleeds, lack of coordination, and loss of appetite. Some of the more serious effects of inhalants include damage to bone marrow, kidneys, liver, central and peripheral neural tissue, and even death from suffocation or fatally depressed central nervous system functioning. Tolerance is also likely to develop in regular users.

Marijuana remains the most commonly used illicit drug in the United States. Almost 66 million Americans (33 percent) have tried marijuana at least once in their lives according to the 1988 household survey (330). An estimated 21 million people (11 percent of the population aged 12 and over) had used marijuana in the last year, and 12 million (6 percent) had used marijuana at least once during the past month. Of the 21 million people who used marijuana at least once in the past year, almost one-third (6.6 million) used the drug once a week or more. Lifetime rates of marijuana use have been steadily declining for the 12-17 age group (from 24 percent in 1985 to 17 percent in 1988) and for the 18-26 age group (from 60 percent in 1985 to 56 percent in 1988), while the rates for the age 26 and over category have been increasing along with the aging pool of individuals who began using marijuana in previous years. Current use of marijuana continued to decrease for all age groups in the household survey.

The high school seniors survey has consistently shown a negative correlation between the perception of risk associated with regular marijuana use and actual rates of marijuana use reported by seniors (306). The percentage of seniors who have experimented with marijuana went from a peak of 60.4 percent in 1979 down to 43.7 percent in 1989, and the annual and current rates (use during the month before the survey) were 29.6 percent and 16.7 percent, respectively. The percentage of seniors using marijuana daily also decreased from 10.3 percent in 1979 to just 2.9 percent in 1989.

In the list of most frequently mentioned drugs in ER episodes, marijuana went from eighth (with 4.36 percent of ER mentions in 1984) to fourth (with 6.69 percent of ER mentions in 1988) (see fig. 2-5) (329). The increased percentage of ER cases associated with marijuana use may be a reflection of the increased strength of the street drug. Marijuana is about 10 times stronger today than it was in the early 1970s (312). The increased strength of marijuana would also help explain the increased perceived risk of regular marijuana use noted among high school seniors (306).

Appendix F

Cost-Benefit Analysis of Drug Abuse Treatment: Declines in Criminal Activity

The consequences of the drug abuse and human immunodeficiency virus epidemics further accentuate the need for policy decisions based on proper scientific assessments. The foundation of sound policy decisions is program evaluation. One of the cornerstones of this type of evaluation is economic assessment.

The most recent analysis that examined economic benefits to society of drug abuse treatment used data from the Treatment Outcome Prospective Study (TOPS) (135,149). This analysis focused only on the economic benefits derived from a decrease in criminal activity during treatment and 1 year after treatment. It compared the average cost of substance abuse treatment in each treatment modality with the savings associated with the observed reduction in predatory illegal acts.

With respect to the social costs of drug-related crime, three cost components were included: costs related to the crime victim (e.g., value of destroyed or stolen property, medical treatment, lost productivity), costs associated with the criminal justice system (police services, adjudication, incarceration), and costs related to crime career productivity, which are basically losses of legitimate productivity for the drug abuser involved in predatory crime (149). Additional cost components included in the analysis were expenditures on illegal drugs, the value of theft, illegal income, and legal earnings. Estimates for these costs were based on self-reported data. Estimates for the victims' costs and costs of the criminal justice system were based on data from the U.S Department of Justice. Crime career productivity costs were calculated for each drug abuser. This estimate was the difference between the self-reported legitimate income and the expected national average for individuals of the same age and sex. There were two perspectives used in the analysis: the cost to law-abiding citizens, which has as a primary component and is thus influenced by crime-related costs; and the cost to society, which is dominated by the degree of the abusers' participation in the legitimate economy.

Costs of treatment and benefits derived from treatment were estimated for each treatment modality for a treatment episode of average duration. Benefits derived from treatment were estimated separately for the time while the client was in treatment and 12 months after treatment. Regression analyses were used to calculate the post-treatment benefits. The analyses controlled for sociodemographic factors, previous treatment episodes, pretreatment crime involvement, and the length of time spent in treatment. Regardless of the perspective and modality, with one exception, the benefit-cost ratio was larger than one (149). This finding implies that the benefits from reducing crime that are derived from treatment outweigh the cost of providing treatment. From the perspective of the law-abiding citizen, for each dollar invested in treatment, estimated savings of $0.30 to $4.00 (according to the modality) are produced. It should be noted that under the societal perspective, the estimated post-treatment benefits for methadone maintenance clients did not reach statistical significance and were not included in the benefit-to-cost ratio. Thus, the 0.92 benefit-cost ratio includes only benefits derived while the client is in treatment. A possible explanation for this finding is that the societal perspective is influenced by the societal integration and legitimate productivity of the drug abuser, an area in which methadone maintenance had limited success (see ch. 4). On the other hand, the benefit to cost ratio to law-abiding citizens (influenced by crime-related costs) for methadone maintenance clients is 4.04, which reflects the reduced criminal activity observed among methadone maintenance patients. Overall, the authors state that the reduction in crime-related costs "appears to be at least as large as the cost of providing treatment and much of the expenditure is recovered during the time the drug abuser is in treatment."

It should be noted that the analysis did not control for differences among patient subgroups and relied heavily on self-reported data. In addition, the measurement of costs has been estimated on an aggregate level and was criticized as "primitive" (17). It is argued that the overall results should be considered tentative (17). The time frame of the analysis was 1 year. Although the associated benefits can be expected to continue over time for those who do not engage in drug use, they may be offset by the costs associated with those who relapse. On the other hand, benefits other than reduction in crime were not factored into the analysis. There are a variety of tangible and intangible potential benefits that can materialize from the reduction of drug use, both to society and the individuals involved, from increased productivity to the prevention of HIV infection.

Appendix G
Highlights From the 1989 National Drug and Alcoholism Treatment Unit Survey (NDATUS)

The most recent findings of the 1989 National Drug and Alcoholism Treatment Unit Survey (NDATUS) were released in July 1990 (332a). These findings are based on data collected as of the point-prevalence date of September 30, 1990. A total of 9,608 facilities reported to the 1989 survey. Drug treatment was provided by 6,287 facilities, including drug-only and drug-and-alcohol combined facilities. Overall, 79.4 percent of all reported drug treatment capacity was being utilized; however, the utilization rate for drug-only units was 90.1 percent. A 12-month total of 995,994 drug abuse clients treated at 5,024 facilities was reported to NDATUS (332a).

A total of 351,430 drug abuse clients were in treatment at these facilities on September 30, 1989. The large majority of these clients, 84.6 percent, were in an outpatient environment; 11.6 percent were in a residential environment; and 3.8 percent were in a hospital inpatient environment. Drug-free treatment was the most common form of treatment with 68.6 percent of all drug abuse clients. Of clients in drug-free programs, the majority 81.1 percent were receiving outpatient treatment; 15.5 percent were in residential treatment and 3.4 percent were in hospital inpatient programs. Of all drug abuse clients, 27.1 percent were in maintenance and 4.4 percent in detoxification. Nearly all clients in maintenance, 97.6 percent, were in an outpatient setting. Of all the detoxification clients, 57.7 percent were in an outpatient environment (332a).

Because of concerns about the spread of HIV infection, the 1989 survey asked treatment facilities to report the percentage of their clients who were intravenous (IV) drug users at the time they started treatment. The estimated number of clients as of September 30, 1989 who were intravenous drug users at the time they started treatment was 129,985. Of these 112,257, 86.3 percent, were listed as drug clients, and 17,728, 13.7 percent, were listed as alcohol clients (332a).

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